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The CHEMIST

MAY, 1936 VOLUME XIII, NO. 5

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May, 1936

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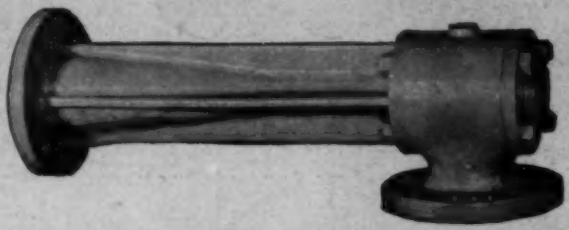

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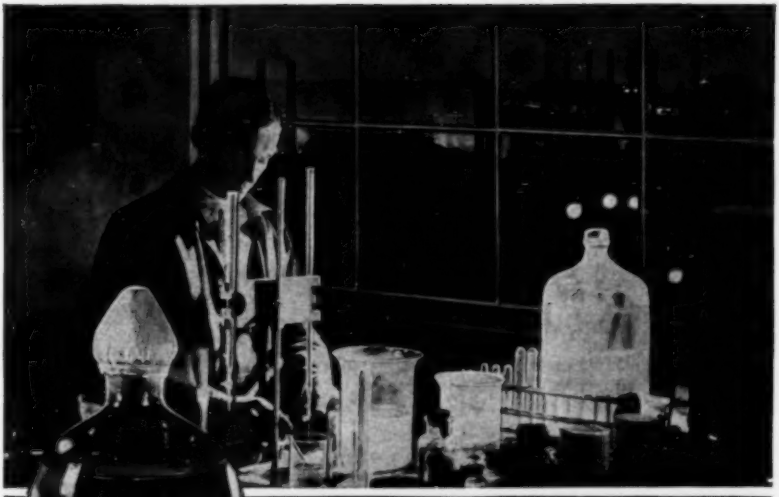

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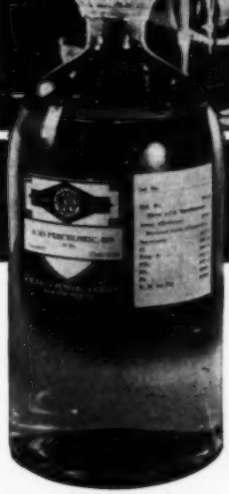

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The CHEMIST

Publication of

THE AMERICAN INSTITUTE OF CHEMISTS, INC.

V. F. KIMBALL, *Editor*, 233 Broadway, New York City

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THE AMERICAN INSTITUTE OF CHEMISTS
HOWARD S. NEIMAN, *Secretary*
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Medal of
The American Institute of Chemists

"For noteworthy and outstanding service to the science of chemistry or the profession of chemist in America."

Awarded for 1936 to

MARSTON TAYLOR BOGERT

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Privileges and Obligations of the Chemical Profession

By M. L. Crossley, F.A.I.C.

Address of the Retiring President of the American Institute of Chemists, Buffalo, N. Y. May 9, 1936

AS CHEMISTS we are privileged to render a high type of service in the shaping of world progress and in providing means for human betterment. The essential problems of life are interwoven strands of chemical phenomena. The secrets of cellular activity, the regulatory powers of glandular secretions over the periodicity of the processes in living organisms, the transformations of the common things about us—water, air, ore, sulfur, wood, salt, and coal—into the luxuries and necessities of modern life, the progress of the stars in their courses, all involve chemistry. An exploration of the core of the atom or an expedition to the realm of the genes calls for chemical guides to point out the underlying truths and interpret their significances.

The privilege of leadership in penetrating into the realm of the unknown is a distinction of tremendous importance. Likewise the privilege of assembling facts, correlating them and ascertaining their value in relation to social growth and economic progress is something to be highly prized. Facts are not important until they are related to the general welfare of mankind.

The chemist has an important part to play in the progress of civilization. His role is that of the architect of human progress, who is responsible for the design to which the structure of human betterment is fashioned, and not that of the disinterested vagrant plodding aimlessly along life's highway until death intervenes to transform his useless organic remains into the saucy, coquettish buds and beautiful flowers of spring.

The rôle of the chemist in shaping the course of modern civilization will be recognized only when selfish individualism gives way to group solidarity of action based upon oneness in purpose and uniformity of method in achieving this purpose. This recognition, essential to professional prestige, is dependent upon both the conduct and the achievements of individual members of the profession. The chemist is measured by the yardstick which he

himself fashions.

For the profession to enjoy an enviable position in public esteem, the majority of its members must manifest a degree of integrity which justifies public confidence in the profession. No profession is any bigger than its members.

The privilege of rendering effective service as a member of an organization imposes a responsibility to safeguard the interests of the profession and to maintain its honor and dignity. The good of the profession must take precedence over personal gain. The status of the profession of chemistry must always depend upon the degree of excellence of the service rendered by those professing to be chemists.

The standard of proficiency set by this Institute may be in spirit all that one could expect for the assurance of competent and efficient service but it will not suffice to justify public esteem for the profession and to give confidence in the integrity of the chemist until we as individual members of the profession recognize the need for united effort to maintain a high professional standing and accept the obligations imposed upon us by the privileges we enjoy in the service of chemistry. The privilege of having the support of the prestige of the organization of the profession in rendering individual service is paramount in the chemist's success; that is, if we measure his success in terms of his contributions to human advancement and ennoblement of life. This privilege to serve humanity with distinction and honor in the cause of truth cannot be had for nothing. It is secured at the price of freedom of individual action. It involves responsibilities which lead to definite obligations; the greater the responsibility, the more constraint on individual judgment and actions.

THERE are certain obligations of the profession of chemistry which I wish to emphasize. They are the main points around which the work of this Institute has been centered.

First is the importance of the obligation to see that chemists are competent to render excellent service. The public must assume that the chemist is capable of rendering a high type of service, if the profession of chemistry is to have a high standing in public esteem. To do excellent work, the chemist must possess unusual powers of observation and must have a keen sense of values. We see only what we wish to see. We record too often

what we wished to observe and not what we actually do observe. The value of information secured from observational experience is of course dependent upon the accuracy of the observation and this depends in no small measure upon the interest which the investigator has in his work. Interest is fed by curiosity. Curiosity to know is therefore a prime requisite of the chemist. He must possess it to a high degree if he expects to do creative work. However, just to be curious is not in itself a sufficient criterion that one has an aptitude for chemical work. The mental habit of curiosity must be cultivated and disciplined to be of value in seeking truth. Simply being curious to know leads nowhere. It must be accompanied by a strong determination to find out and by unlimited reserves of energy to follow the trail to the end without faltering. In pursuing the evasive sphinx, truth, to secure chemical knowledge, mental honesty is indispensable. Preconceived notions that lead to set prejudices must be forever watched and guarded against. Evidence that is tainted by prejudice is usually both faulty and fragmentary. The chemist must be trained to get the facts without pre-judging them. Facts must be secured from various sources, then correlated, evaluated, and organized into evidence that will help in formulating an intelligent plan of attack which, if executed efficiently, should lead to worthwhile results. It is of the utmost importance that the chemist should be trained to differentiate between facts which suggest the course of action and facts which denote that the journey through the realm of the unknown is over; that the signals should be interpreted to read "stop". He must get the facts which will give him the soundings along the chosen course and then he must recognize the importance of the evidence from his own experience and work in arriving at conclusions concerning the value of the results. It is just as important that he know when to stop experimenting as it is that he know when to begin. The start always involves a preliminary judgment of the facts available to determine if there is a problem and if it is worth solving; that the solution of a problem will lead to a new product or procedure is not enough justification for spending time and money to solve it. The change brought about by the results must be of such significance as to indicate that it will benefit society before it should be made. To judge wisely the chemist must have imagination disciplined by a broad training in fundamentals. It is only

by having a wide knowledge of the general facts of life that he learns to be tolerant of views which are new or different from those he holds. Toleration for the facts that do not please, that upset one's mental equilibrium and cause re-adjustments of ideas as well as the thinking process or habits of thought is not a common endowment of mankind. It is an attribute which is largely acquired only after painstaking care to cultivate it.

THE BASIC training of the chemist should be sound and broad enough to fit him to think logically and work effectively. Proper fitness for service in chemistry involves more than a profound knowledge of chemistry. It requires that the person be trained to think. To live up to his possibilities, the chemist must be trained to think beyond the facts of chemistry. He must likewise be trained to take his place in his community as an important citizen. He must be capable of being inspired by the potentialities for good in his profession. He must be able to catch the vision beyond the sordid exacting details of his work and be fired with enthusiasm and ambition; essential, if he is to soar to the lofty heights where only the most sublime and rare thoughts dwell. For the most part we are only common, average individuals. However, it is only when we ascend to the lofty peaks of endeavor, determined to face every obstacle, that we have any chance of success. These heights are not reached without a struggle—a furious struggle, which few have the endurance to overcome.

The capacity to be inspired is fundamental to the maintenance of high ideals. It may not be altogther within the reach of all, but I am persuaded that it can be acquired to a greater degree by many. Education has much to do with it. Inspiring teachers lead men on to accomplishments far beyond their ordinary powers based on indicated capacities and potentialities. Teaching must always be inspirational to fulfill its educational possibilities. No worthwhile result in any field is obtained without the aid of the inspirational element. In training chemists the teacher has an important mission. His task is more than to simply expose his erudite mastery of the abstract facts of chemistry; it is to inspire men to want to know, to arouse in them that element of idealism which is essential to ambition, without which human service is of a low order and imagination and skill are wasted talents. The teacher

of chemistry is more than a textbook spigot from which flows a stream of insipid, unintelligible chemical facts, formulas, constants, and equations unrelated to any human good.

The privilege of service in the profession of chemistry imposes an obligation to consider human relations and ethical values. The chemist must guard his reputation with zealous care. This involves thoughtful decisions, risking often favor and position, to safeguard personal honor and professional dignity. He cannot be a patent racketeer or a process vendor and retain his self respect and honor. Both of these problems arise to trouble the average chemist more often than is good for the profession. The chemist is often wholly responsible for the problems arising. It is he who chooses to appropriate patent rights for the use of his employer before any question of the validity of the patent has been settled. The most flagrant violations of the obligations of the ethics and honor of the profession come about by persons who profess to be chemists but who have no right to this distinction for they are merely "pot boilers". They are the parasites of the profession. They do nothing of importance themselves but, like the professional robber and racketeer, close in on patents as soon as they issue and boldly infringe them. Often they get the credit for the accomplishments of the persons who created the knowledge disclosed in the patents. No patents are safe from their marauding raids. By intent and in effect they are plain robbers. So long as they masquerade as chemists they injure the reputation of every member of the chemical profession and lower the status of the profession as a whole.

Still more troublesome is the person who is a chemist but who has lost his ideals or who has sacrificed the only ideals he ever had with the hope that in so doing his dinner pail is assured. He too disregards patent property rights and in certain cases advises his clients or employers to deliberately infringe, even though there is no doubt of the rights of the owner of the patent to the protection granted him for the disclosure of his invention.

The costly procedure of proving infringement permits this practice to continue, particularly among small irresponsible industrial organizations and presents a serious menace to both the legitimate chemical business and the chemical profession.

The American Institute of Chemists, as sponsor for the profession of chemistry, must deal fearlessly with such persons and

deny them the right to justify their criminal acts under the guise of their being privileged as chemists to extract all of the information they can get from whatever source and dispose of it as their own property.

The chemist cannot afford to be a racketeer or a process vendor. His knowledge and experience are his main assets. It is important that he should use these assets honorably and legitimately. With these assets he qualifies as a professional expert capable of interpreting and applying the facts at his command. Like other professional men of high standing, he must apply all of his knowledge, experience and skill in solving the problems arising in his work without violating confidences previously entrusted to him. It is his obligation to safeguard the interests of his employers as zealously as he would his own without enslaving himself. This is true regardless of the capacity in which he serves. The ethical principles are the same whatever his position. His integrity will always be measured by his professional conduct.

THE STATUS of the chemical profession and the integrity of the chemist are at stake. The process vendor is a menace to all. He peddles his wares with shameless regularity and abandon. The collections come from here, there and everywhere. They are always sure winners. To the uninitiated they are impressive. Like all gold bricks, they find interested buyers. Too often the chemist is confused with the process vendor. This is because the process vendor is often a capable chemist who believes that he is entitled to peddle his "canned" knowledge of previous employer's processes. More often he is simply a broker handling this stale "canned" knowledge as he would any commodity. He usually has no conscience and is seldom hampered by principles. The process vendor by assuming the title of "chemist" associates the practice of taking and selling processes with the chemist, establishing a false conception of the honesty and integrity of the chemical profession.

The chemist must recognize that he is responsible for this situation and endeavor to correct it. He must dissociate himself from the process vendor. As an expert, he must seek opportunity to serve, with the backing of The Institute, his professional organization and not as an individual who is in possession of process information. It must be realized that no member of a digni-

fied, honorable profession can afford to do anything that will damage his standing and involve the reputation of the profession.

The profession of chemistry has also an obligation to its members to help them to render efficient service. It can discharge this obligation best by providing the means for fitting the proper person to the proper job. It is not sufficient to find employment for the unemployed. A much larger problem, involving greater service to both the chemist and his employer, is that of maintaining a Bureau of Appointments which is in charge of a chemist of distinction and wide acquaintance and which has as its purpose the proper orientation of chemists in chemical service. It is important that the right capacity for service should be put to work where it can be most effective. This bureau should also be charged with the responsibility for the welfare work of the profession. This should be organized on a sound financial basis, providing proper means for the amortization of the investment the chemist makes in his service to society.

These things will do much to promote the future welfare of the chemist, enabling him to render his best service to humanity. They should also stimulate interest in the profession of chemistry and help it to take its rightful place among the learned professions in America.

United States Civil Service Examination

The U. S. Civil Service Commission announces an open competitive examination for the position of Principal Biochemist at $5,600 a year, in the Bureau of Chemistry and Soils, Department of Agriculture. Applications must be on file with the Commission at Washington, D. C., not later than June 22, 1936. Duties of the position are to inaugurate, plan and direct investigations on the chemical character, physiological properties, stability and distribution of allergens derived from agricultural products. To plan and direct correlated clinical studies on allergic and normal human subjects and to supervise the preparation and standardization of allergens appropriate for clinical use, etc. College degree, seven years of experience in biochemistry, and/or postgraduate work, are expected of applicants. Application forms may be obtained at any first-class post office, from the U. S. Civil Service Commission, Washington, D. C., or from district offices.

Presentation of the Medal of The American Institute of Chemists to Marston Taylor Bogert, F.A.I.C. at the Annual Meeting, Buffalo, New York, May 9, 1936.

MARSTON TAYLOR BOGERT
Medalist

M. L. CROSSLEY
Retiring President

Marston Taylor Bogert, courageous explorer of the unknown realms of chemistry, lucid interpreter of the significances of the results of research in the advancement of civilization, inspiring teacher, brilliant scholar and valued friend, The American Institute of Chemists awards you this medal for your noteworthy and outstanding services to the science of chemistry and to the profession of chemist in America.

The Onward March of Synthetic Organic Chemistry

By Marston Taylor Bogert, F.A.I.C.

Address delivered by the Medalist at the Annual Banquet of The American Institute of Chemists, Buffalo, N. Y., May 9, 1936.

PRIOR to 1828, it was the generally accepted belief that the products peculiar to life processes, the so-called "organic" compounds, differed fundamentally from inorganic or mineral products, in that the former owed their origin to a mysterious "*vis vitalis*", or vital force, which transcended the recognized laws governing the chemical properties of the latter, and that therefore it would never be possible to produce true "organic" compounds without the intervention and assistance of this vital force.

In 1828, however, Wöhler showed that when ammonium isocyanate, then universally regarded as an inorganic or mineral compound, was heated, it changed rapidly into urea, a characteristic product of animal life. This was the first staggering blow at the "vital force" theory, and it was soon followed by others which, as is now a matter of history, finally overthrew this theory completely and proved conclusively that the elements present in living organisms are subject to exactly the same laws as govern their behavior in the laboratory.

The stage was thus set for the extensive development of synthetic organic chemistry which ensued. Tens of thousands of new compounds were prepared, their physical and chemical properties studied, necessitating constant expansion of methods of classification and nomenclature. The vast possibilities inherent in such synthetic methods began to be increasingly appreciated and understood, how very complicated molecules could be built up from simpler units, from the elements themselves, if desired, how one group could be converted simply and quickly into another, and how these methods of synthesis supplied the most satisfactory evidence of the constitution of the compound so prepared. If it is true that "the proof of the pudding is in the eating thereof," it is equally true that the final proof of the structure of an organic compound is the synthesis thereof.

As was to be expected, with such methods developed and available, the organic chemist then turned his attention to important products of animal and vegetable life, with which mankind had long been familiar, and set about wringing from Nature the secrets she seemed so loath to disclose concerning their exact chemical character. The results were truly revolutionary, for he not only solved the problem of their constitution, but in very many cases succeeded in building them up, step by step, from simpler units, so that today a host of important products formerly supplied by Nature has been largely or wholly displaced by synthetics, and this number is steadily and rapidly being augmented.

In so far as the natural products are concerned, the more difficult problem in the elucidation of their constitution is frequently the analytic rather than the synthetic one; i.e., the deduction of a likely structure for a compound from a searching and often very laborious study of its physical and chemical properties. As a rule, this takes much longer than the synthesis of the structure so deduced, for the resources of the synthetic organic chemist are so comprehensive and so highly specialized that only the most complicated or unstable structures can still defeat him.

THE PROGRESS of synthetic organic chemistry during recent years has been wellnigh incredible. Hundreds of thousands of carbon compounds have been prepared and described. Every day discoveries are recorded which add new compounds and new knowledge. The possibilities are practically limitless. The preparation of compounds solely because they were new, long ago ceased to appeal very strongly to the organic chemist, because this was something which the veriest tyro could do and required but little knowledge of the subject or any high degree of technical skill. It has for some time been recognized in our leading organic laboratories that there should be some more important and deeper seated purpose back of it all. In our own laboratories, we have been interested in such problems as the connection between chemical constitution and properties of all kinds, physical, chemical, and physiological; the elucidation of the mechanism of reactions, by the isolation and identification of the various intermediate steps; the synthesis of wholly new types or groups of compounds, for the study of their properties; the discovery of compounds of therapeutic value; the utilization of industrial wastes

and by-products; building the scientific foundations for new chemical industries; the modification of natural or synthetic commercial products, so as to adapt them to new uses and open new markets to them; more economical manufacture of important products, by changes in raw material, process or yields; and the synthesis of compounds of interest to biology and medicine; particularly for the purpose of throwing light upon their biogenetic origin, their chemical relationship, and their physiological function in the living organism.

Nature never standardizes her products, whether they be medicinals, dyes, perfumes, or something else, and the same plant species, for example, yields products which change with the changing conditions of climate, season, soil, temperature, rainfall, fertilizer, and many other factors. Further, the natural product is generally a mixture, whose inconstant composition renders its integrity difficult of proof, the evidence of its sophistication often laborious and inconclusive, and the exact duplication of effects almost impossible. The synthetic, on the other hand, is a homogeneous individual substance, of fixed and definite properties, whose purity or adulteration is easily established. The contaminants normally present in genuine natural products, not only are likely to interfere with obtaining the particular effects sought, but they may, and often do, lead finally to resinification, darkening, and decomposition.

HOW CAN we draw any correct conclusions concerning the connection between molecular structure and physiological effects, tinctorial properties, odor, or physical properties, unless we are dealing with pure chemical compounds? A Materia Medica composed of galenicals, is, to say the least, semi-civilized if not primitive.

In the case of plant products, the crop is dependent upon the uncontrollable vagaries and uncertainties of the weather, and the farmer must wage a never ending battle with plant diseases, parasites, blights, and pests of all kinds. The yields are therefore uncertain and subject to wide fluctuations. The labor costs involved in growing, cultivating, harvesting, and preparing such products for the market, in our own country at least, are likely to be high. A closely parallel set of obstacles confronts the raiser of animal products. The case for the synthetic is much more

favorable, both as regards labor costs and the fact that process and yield are always under control and relatively constant.

Natural products tend to rise in cost with mounting labor charges, and prices fluctuate with the quantity and quality of the harvest. The price of synthetics, *per contra,* varies much less and is consistently downward, as new or improved methods of manufacture are discovered, economies developed, and wastes and by-products utilized. The cost curves may at first favor the natural product, but almost invariably and inevitably these curves soon cross, and the complete triumph of the synthetic follows.

Nations are much more likely to be cut off from their supplies of natural products than of synthetics by wars, since the initial materials for the latter are much more generally available.

Compared with the rich promise of the synthetic organic laboratory, that held out by natural substances is poor indeed. There is little likelihood of the discovery of any considerable number of novel and important products in the latter field, and this number is quite certain to decrease rather than increase as the years roll by. Contrast the vast army of new and valuable synthetics with the corporal's guard of useful natural products discovered and introduced within the same period.

The possibilities for new synthetics are boundless and their value incalculable. We have scarcely crossed the threshold of this wonderful treasure house of the organic chemist, overflowing with splendid opportunities for service, through scientific investigation, to chemistry, medicine and biology, to industry and art, to civilization and progress. Who can assess the sum total already contributed in these directions by the achievements of synthetic organic chemistry?

The simple compounds which function as initial materials, or building units, for the organic chemist, like carbon monoxide, ethylene, acetylene, the simpler alcohols, aldehydes, ketones, acids and esters, the products obtainable from petroleum, coal tar, electrolytic and catalytic processes, are daily growing cheaper and more easily accessible; methods of synthesis are rapidly multiplying and becoming less difficult, as operating details and conditions for optimum yields are worked out.

Woe to that manufacturer of organic products in this day and generation who treats with scorn and ridicule the suggestion that his business might be affected adversely by the activities and

discoveries of the synthetic organic chemist, and persists in fatuous and fancied security to travel in the same direction followed for generations by his ancestors! That path is already well lined with the ruins of factories whose managing directors had neither the vision nor the intelligence to understand the constantly iterated apothegm and warning that today scientific research is not merely the price of progress, but is still more truly the price of existence. Political protection is a very poor substitute for it.

SHOULD you feel that I am unduly prejudiced in this matter, suppose you walk with me a short distance along this wreck-strewn road and let me recall what some of these ruins once were and in what way the complete ignoring of their dependence upon synthetic organic chemistry was responsible for their downfall. With the exception of the point at which we enter, the rest of the road covers the period only of my own life.

In 1856, the late Sir William Perkin, then only a youngster, while endeavoring to devise a method of preparing quinine synthetically, oxidized commercial aniline oil, and obtained instead a purplish dye, which he called "Mauveine." This was the first of the so-called "aniline" or synthetic dyes and its discovery attracted considerable attention. The suggestion, however, that some day such artificial dyes might displace the natural ones was received with the usual incredulity, contempt and ridicule by some, and was attacked by the more pious of the community as blasphemous. As though man-made dyes could hope ever to displace such God-given coloring agents as madder, indigo, and cochineal!

Twelve years later (1868), Graebe and Libermann worked out a commercially profitable process of synthesizing, from the anthracene of coal tar, the alizarin which is the chief tinctorial constituent of the madder and, within the brief space of ten years, the annual output of madder fell from over 500,000 tons to less than 500 tons. This occurred in the face of attempted protective legislation by the French government; for the industry was largely a French one, decreeing that none of the bright red trousers then worn by their soldiers should be accepted unless dyed with madder. Today, madder is of historical interest only.

Indigo is probably the oldest dye known to man. It may be hard to prove that the blue room in Noah's ark was decorated

with it when he embarked upon his historical cruise, but it is scarcely to be doubted that Joseph's "coat of many colors" owed no small part of its brilliance to this common article, for indigo has been found in the pyramids of Egypt, in the ruined cities of Babylonia, and in the shops and houses of Pompeii. It is produced by many different plants, found in many countries, and for untold ages has been used by savages and civilized alike. Once a world-wide industry, the output of natural indigo has now fallen to such insignificant figures, even in India, as no longer to justify the publication of much statistical information about it. The chemist has succeeded in improving upon the leisurely and complicated processes of nature to such an extent that synthetic indigo is now produced easily and economically from aniline, at a lower cost and in higher purity than the natural article. The indigo farmer, like the madder grower and the cochineal raiser, has been compelled to utilize his land for other crops, possibly to the raising of much needed foodstuffs, in the case of India. If the necessary chemicals were available here, I could show you how, merely by mixing two colorless solutions, indigo is instantly precipitated 100% pure. All this is but the sequel to the discovery of the first synthesis of indigo back in 1870.

NOT ONLY has the organic chemist succeeded in beating nature at her own game in the production of these active dye principles, but he has also far surpassed her by turning out from his laboratories tens of thousands of new dyes, of every hue of the rainbow and not found anywhere in nature. Compared to the vast industry of synthetic dyes, that of the natural dyes is practically negligible. The finest and fastest dyes now known are not obtained from the animate world, but from the inanimate; not from plants or animals, but from the laboratories and factories of the organic chemist.

Every one is familiar with what rayon has done to the silk industry. But those interested in other fibres, like wool, cotton, hemp, etc., still labor under the delusion that their industries are exempt from any such misfortunes. I would warn them not to read *CHEMICAL ABSTRACTS,* if they wish to avoid worry and anxiety about the meddlesome activities of these pestiferous organic chemists.

Wood seemed to the wood distillers about as cheap a raw ma-

terial as any one could use for the production of wood alcohol (methanol), acetic acid and charcoal, so why should they spend any money on scientific research? But along came these troublesome chemists again, and Lo and behold! one morning a cargo of synthetic methanol arrived from abroad, produced from the carbon monoxide obtained as a by-product or waste gas in various factories, and this cargo was offered at a price well below that current for the wood distillers' products. What happened was characteristic. The United States industry promptly sent representatives in two different directions. One went abroad, to arrange a deal with the foreign manufacturers and holders of the patents, the other traveled to Washington, to induce our Government to raise the import duty on methanol. The object of both was to maintain the existing price level and prevent our citizens from getting their goods at anything less. In other words, the American consumer was to be penalized for the incompetence and unprogressive attitude of these manufacturers.

This same industry had to face an attack from another direction also, in the competition of its acetic acid with that produced catalytically from acetylene from calcium carbide.

Not long after the arrival of synthetic methanol in this country, I happened to be discussing the subject with one of the officials of a company manufacturing ethyl alcohol, and asked him what his concern was doing to avoid a similar disaster, inasmuch as ethyl alcohol had been synthesized from acetylene many years before. His reply was not unlike that of the wood distillers, namely that their raw material, "black strap" molasses, was so cheap that there was no chance whatever of the synthetic product ever being able to compete with their present process. Now that hundreds of thousands of tons of synthetic ethyl alcohol are being manufactured annually, his song has probably changed somewhat.

The great naval stores industry of the South, producing spirits of turpentine and rosin, knows to its sorrow what competition with synthetics means, for their turpentine has been driven out of many markets by synthetic solvents, and their rosin out of others by synthetic resins and plastics.

Look what has happened to Chilean nitrate since chemistry showed how to obtain our nitrogen from the air!

It may well be that long before our petroleum resources ap-

proach exhaustion, the production of oils by the hydrogenation of coal, by processes like that of Bergius, will have reached a point where we need have no more anxiety on that score.

The advent of Duprene and of various synthetic rubbers foreshadows the final displacement of the natural product.

AND SO I might ramble on and on, pointing out what has already happened or is happening to various industries, in this struggle between natural and synthetic products, and my belief, based upon these observations, that in such a contest, the final triumph of the synthetic is certain and ineluctable.

Lest you gather from this trip that the synthetic organic chemist is ever a destroyer, let me lead your thought for a few moments into other paths, which will convince you that he is primarily and consistently a creator, and that in those cases where his discoveries have caused the abandonment of an industry, or of a certain line of manufacture, it has been only to replace it with something better.

Obviously, in the brief compass of this address, all that can be done is to name some of the new industries which have resulted from his creative activities. Necessarily such a list is only illustrative and covers but a small fraction of the total.

In addition to the great industry of the **Synthetic Dyes,** which has been discussed already, I would like to mention the following:

Synthetic Drugs.—Slowly but surely, the organic chemist is providing a really scientific materia medica, to replace the shotgun remedies and natural products of uncertain and variable composition upon which the physician of a few decades ago was wholly dependent. Think what it means to suffering humanity to have available such products of the organic laboratories as ether, chloroform, arsphenamine (salvarsan), procaine (novocaine), acetylsalicylic acid (aspirin), barbital (veronal), phenobarbital (luminal), phenacetine, trional, chloral, and the like. What general anesthetics, for example, are available among the natural products to replace ether, chloroform, ethylene or cyclopropane? In his fight against disease and death, the doctor has no more potent or resourceful ally than the organic chemist, and this fact is increasingly appreciated and understood.

Perfumes and Flavors.—Day by day, the prejudice against the

use of synthetics in fine perfume blends is being overcome, as new products of delicious fragrance emerge from the laboratories of the organic chemist, and the percentage of such compounds in perfumes for all purposes is steadily mounting. The perfumer now has at his command a host of new odorous synthetics, the quality of whose fragrance is often equal to that of the finest floral products, but whose individual aromas differ from anything found in nature. This provides him with his most eagerly sought desiderata, namely totally new and arresting odor notes.

THEN there are the industries covering the manufacture of **Synthetic Resins and Plastics,** of whose scope a good idea may be gained by consulting the new two volume edition of Ellis's handbook on this subject; new **Solvents, Lacquers, Enamels,** etc.; new types of **Detergents, Wetting and Penetrating Agents,** consisting of sulfates or sulfonates of high molecular alcohols, etc.; organic **Vulcanization Accelerators,** like the mercapto-benzothiazoles, phenylated guanidines, etc.; **Insecticides, Fungicides** and **Pest Eradicators** of all kinds; **Photographic Developers,** like metol and hydroquinone, and **Photosensitizers,** like the cyanine dyes; high-power **Explosives,** like the nitrates, nitro derivatives, fulminates, and azides, for use in peace more than in war; **Toxic Gases,** as war equipment, such as phosgene, diphosgene, chloropicrin, mustard gas, chloracetophenone and diphenylchlorarsine; new **Fuels,** for automobile and airplane engines; **Anti-knock** preparations, like tetrethyl lead, for use in internal combustion motors; **Synthetic Tannins, Synthetic Refrigerants, Flotation Agents, Food Preservatives, Synthetic Camphor** from turpentine; a whole group of industries dependent upon **Cellulose** as initial material and supplying us with a host of useful products; and those industries which depend upon the manufacture of synthetics from **Calcium Carbide** and **Calcium Cyanamide.**

The organic chemist, like other scientists, possesses an inordinate and insatiable curiosity and thirst for new knowledge. When he has finally established, by synthesis, the constitution of some valuable natural product, he immediately initiates other sets of experiments, to see if he cannot improve upon nature's handiwork, and in this task he is quite often successful. His first line of attack may be to discover whether the entire molecule is necessary for the important effects observed, or only a certain portion

thereof. If the latter, then he endeavors to build up simpler molecules containing these active groups, and this is the explanation of the origin of many remedies, perfumes, dyes, etc.

Another line he often follows is the modification of the original molecule by suitable chemical treatment of the compound itself, or by appropriate variations in the building blocks employed in the synthesis, in the well-grounded belief that some of these modifications may exhibit greater potency. Thus, it is quite possible that by such methods the striking physiological effects of the enzymes, vitamins, and sex hormones, for example, in some instances may be secured with simpler molecules, or in other cases be found in startlingly higher power, in some of their derivatives.

IN THE TRIUMPHANT progress of synthetic organic chemistry during the past few years, let us recall just a few of its more noteworthy achievements. In 1893, Tiemann and Krüger synthesized the odorless pseudoionone and violet-perfumed ionones from the citral of lemongrass oil, where it had been discovered and identified three years before by Dr. F. D. Dodge in our own Organic Laboratories at Columbia University.

From this pseudoionone, twenty years later (1913) Kerschbaum prepared the perfume alcohol farnesol, one of the odorous constituents of acacia blossoms and of ambrette (musk seed) oil, and ten years after this, from the same initial material, Ruzicka synthesized the nerolidol, to which the orange blossoms owe much of their fragrance.

From pseudoionone also, the synthesis of phytol, one of the chief constituents of chlorophyll, was completed by F. G. Fischer and Löwenberg in 1929; and in 1931, Karrer and his co-workers showed that when dihydrophytyl bromide was treated with metallic magnesium or potassium the bis-dihydrophytyl which resulted was identical with the perhydrolycopene obtained by catalytic hydrogenation of the red coloring matter of the tomato. Thus was established the structure of the carbon skeleton of this important carotenoid hydrocarbon.

Karrer and his associates also showed that same year (1931) that when farnesyl bromide, prepared from synthetic farnesol, was subjected to the action of metallic potassium, the di-farnesyl so formed was identical with the hydrocarbon squalene, an important component of the liver oil of the shark. The struc-

ture of squalene thus was made manifest. Who would have thought that shark liver oil and acacia blossoms had anything in common?

It was Karrer also and his group, in Zurich who, likewise in 1931, settled definitely the structure of the carbon skeleton of vitamin A, by the synthesis of perhydrovitamin A from *beta*-ionone, and the demonstration of its identity with a perhydrovitamin A prepared from a vitamin A of natural origin.

Inasmuch as *beta*-carotene was recognized as a provitamin A, and all the evidence indicated that one molecule of the $C_{40}H_{56}$ carotene broke in the middle into two of the primary alcohol vitamin A, $C_{20}H_{30}O$, by hydrolytic cleavage, proof of the constitution of this vitamin carried with it the conclusion that *beta*-carotene probably had a similar structure, and this was fully borne out by subsequent investigations. As carotene was discovered by Wackenroder in 1831, it took just a century to wrest from nature this particular secret.

Other striking syntheses were those of thyroxin by Harington in 1926; hemin by Hans Fischer, in 1929; anthocyans by Robinson, in 1931; vitamin C (ascorbic acid) by Reichstein, Haworth and Hirst, in 1933; hormone of corpus luteum by Slotta, Hartmann and Wettstein, Butenandt, and Fernholz, in 1934; and the partial synthesis of the male hormone, androsterone, by Ruzicka, also in 1934.

THERE is nothing new, startling, fantastic or ridiculous about the prophecy that man will some day have it in his power to develop a superior human race with the assistance of suitable chemicals. This prediction has been made repeatedly in the past by chemists, biologists and medical men, and is likely to be voiced more frequently in the future, as our knowledge of the chemistry of life becomes clearer and more comprehensive.

Prior to 1828, the prophecy that it would one day be possible to synthesize "organic" compounds without the assistance of any "vital force" was received with equal incredulity.

The organic chemist has already in his hands, or soon will have, the knowledge and skill to determine the chemical character of practically all products of life activities, human as well as others, to build them up synthetically in 100% purity, and in many cases to improve them.

It is, of course, admitted that we still must use, in the treatment of disease, various biologicals, glandular secretions, sera, vaccines, antitoxins, and the like, but even in the case of these complicated mixtures, their effects must be due to definite chemical constituents, and when once the molecular structure of these active constituents is known, their synthesis will finally be achieved, as surely as the dawn follows the darkness.

The further the organic chemist searches and the deeper he delves, the clearer becomes the intimate relationship between those compounds upon which human life in its various manifestations depends, and the more he is impressed by the startling effects upon the human of comparatively simple changes in such products.

Some of this work has been astonishing, in that it has shown a previously unsuspected close chemical relationship between products of grave importance to human life and activities. This has thrown an immediate flood of light upon biological processes hitherto obscure or misunderstood. It now appears likely that the sterols (like cholesterol, for example), which are primary cell constituents, break down in the human organism into the bile acids, and the latter in turn suffer a further degradation to the sex hormones. Chloesterol is present in the bile (gall stones may contain over 90% of cholesterol), blood, brain, skin, etc.

IT HAS BEEN shown by Steenbock and others that the sun's rays, or irradiation with a mercury arc light, will transform sterols into the fat-soluble antirachitic vitamin D. The presence of this vitamin in the body seems essential for the maintenance of proper calcium metabolism. What of it? Well, Dr. Walter Timme, of the Neurological Institute, New York City, has been quoted as follows: "Crossness, tiredness, misbehavior and all the other symptoms of problem cases, both child and adult, result when the blood has too little calcium." This condition has "apparently a disturbing effect on the nerves and subsequent conduct of the individual who then misbehaves, showing inordinate fatigability, irritability of temper, and at times even incorrigibility, non-amenability to discipline and assaultiveness. . . . These patients were easily aroused to a high pitch of anger at the slightest provocation. A word, an insinuation or even a glance being

sufficient to arouse intense antagonistic reaction. . . . At home, a harsh word from any member of the family, at the table for instance, would result in a plate or knife or some other utensil being thrown at the aggressor. In school, a blow, a shout or a curse would be hurled at a fellow student or even at the teacher."

The importance of vitamin D in foods is thus manifest, and its intimate chemical connection with the sterols (especially ergosterol), the bile acids and the sex hormones. Further, it has been found that all have exactly the same hydrocarbon nucleus, phenanthrene, $C_{14}H_{10}$, a compound found in coal tar associated with its isomer anthracene.

Other researches have shown that phenanthrene is also the nucleus of the cardiac poisons of the strophanthidin and bufotalin groups, of certain sapogenins, and of at least one of the fungus pigments.

For many years it has been known that phenanthrene is also the nucleus of the very important morphine group of alkaloids; as well as of the so-called resin acids, of which gum turpentine and rosin are chiefly composed.

The brilliant investigations of Cook and Hewett and their associates, of the Research Institute of the Cancer Hospital, London, England, have led, on the one hand, to the discovery and identification of definitely cancerigenic hydrocarbons in those fractions of coal tar responsible for the well-known "coal tar cancer" and, on the other hand, to the synthesis of totally new cancerigenic hydrocarbons. One striking thing about these cancerigenic hydrocarbons, whether isolated from coal tar or prepared synthetically, is that they too all contain a phenanthrene nucleus, although phenanthrene itself is not cancerigenic.

Finally, Dodds and Cook, have examined a number of these phenanthrene derivatives with reference to both cancerigenic and estrogenic properties, and have discovered that some of them are active in both respects. One of these (1, 2, 5, 6-dibenzanthracene), which is carcinogenic but not estrogenic, loses its cancerigenic properties and becomes strongly estrogenic when a few simple changes are made in its molecular structure.

The phenomenon of estrus, or "heat", in female animals, seems to be due to definite hormones present in the ovarian follicles, from which they can be extracted by suitable solvents. The urine of pregnant women contains large amounts of similar estrogenic

principles, and it is these and related sex hormones, both female and male which have now been proven to be phenanthrene derivates. Some simple phenanthrene compounds have already been built up synthetically by the organic chemist which, when injected into unsexed animals, produce all the phenomena of the estrus cycle, and, in the case of capons, result in the development of feathers of the female type.

Such sex hormones appear to exist throughout the entire animal kingdom and to occur also in plants, as judged by the work of Butenandt and Jakoby. It has been stated that there are plant hormones which stimulate sexual activity in animals, and that animal sex hormones stimulate blossoming and ripening in plants.

Chemistry, like politics, does indeed make strange bedfellows! Here we find intimate chemical connections established of which we scarcely dreamed a few years ago, and we are still only at the threshold. Animal and plant life are linked up through resin acids, alkaloids, cardiac glucosides, sterols, vitamin D, bile acids and sex hormones with closely affiliated hydrocarbons of carcinogenic activity.

THE POTENT influence of diet upon the individual is being increasingly understood and appreciated. The effects of drugs upon man have been studied ever since he appeared upon this planet. The disastrous results of the improper behavior of glands, or other vital functions, are well known.

But some things do not seem to be fully understood yet. The first of these is that the human body is an organic chemical factory, in which the reactions which take place are governed by the same laws as in the organic laboratory.

Second, it is not necessary to consume a bale of hay, or a ton of vegetables, to get a small amount of essential vitamin or sterol, if the organic chemist can supply you with a pure synthetic product. Third, the chemical reactions going on in the living organism, in the brain as well as elsewhere, influence the growth and development of the individual, not only physically but, in my judgment, mentally and morally as well.

Any one who has had experience with drug addicts will testify to the terrible consequences of such addiction upon the mental and moral character of the man, as well as upon his purely physical being. The drugs known as delirifacients possess the

property of unseating the reason, at least temporarily.

If, then, by the action of chemicals we can influence injuriously man's mental and moral state, why is it unthinkable that the chemist will some day discover how to accomplish exactly the opposite effect and thus aid in the development of men of greater mental power, loftier aspirations and nobler ideals? Personally, I am confident that he will, and that, too, much sooner than we now believe possible.

Nor is it improbable that sex will finally be controlled, not by the dietitian or by the physician, but by the organic chemist, for the latest discoveries indicate that the female ovarian and the male testicular hormones are both derivatives of a cyclopentenophenanthrene and differ only in the fact that the male hormone ($C_{19}H_{30}O_2$) has one more carbon and a few more hydrogen atoms than the female one ($C_{18}H_{22}O_2$).

Hybrids, as we all know, are generally sterile. Should it be found some day that this sterility was due to the lack of some essential chemical (a hormone, for example), which the organic chemist could supply, think what this would mean to the plant and animal geneticists.

In all of this, be assured that a leading roll will be played by the synthetic organic chemist.

The Medalist

By R. R. Renshaw

Professor of Organic Chemistry at New York University

Dr. Bogert's former pupil reviews the career of his professor. Abridgment of an address made at the Annual Banquet.

OF COURSE, we all realize the impossibility of presenting a full account of the medalist's life and activities in the allotted time of thirty minutes. In fact, the honors which he has received and the deeds that he has accomplished which I will not mention would make a list which any of us would be glad to have as a monument of our life work.

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The medalist entered Columbia College in 1886. I knew many years ago that he must have been a student filled with college

spirit. The reason I knew this was because I knew him to be an affectionate and loyal husband and father and a man who worked for the interests of his profession with untiring enthusiasm, and one who carried out all of his civic duties, whether to the community, state, or nation, with patriotic pride. Such a man always has a great deal of the right kind of college spirit.

I find that he did take an active part in college life. Among his fellow students he became prominent as President of his class and as Chairman of the student body. In athletics he went in for putting the shot, rowing, high jumping, and he played the flute in the college orchestra. . . . He also became a top-notch ice skater. The Havemeyer Chemical Laboratory in which we worked overlooked the walled-in campus and athletic field of the Barnard College girls. I recall seeing him on several occasions performing some beautiful skating maneuvers on the artificial ice pond which had been made in this enclosure. I, and the other bachelor graduate students, often looked over into this enclosure, and during the years that I was there, Bogert was the only man I ever saw in this prohibited ground! Yes, he seems to have had a way with the ladies, too. Further emphatic evidences of this was that he won and married the beautiful and charming Charlotte Hoogland, and then began an idealistic domestic relation, later enhanced by two lovely daughters.

The medalist graduated from Columbia College and entered the Columbia School of Mines, where he specialized in chemistry, and made a truly unparalleled scholastic record. . . . Appointed as assistant in chemistry, he then rose rapidly through the ranks of tutor, instructor, adjunct professor, and finally in 1904 was appointed to the first professorship in organic chemistry in the University.

As a college lecturer and teacher, Professor Bogert has been unusually successful. His mental processes, always systematic and precise, enabled him to present the wonderful classification and the inter-relations of carbon chemistry in such an orderly way as to awaken the enthusiasm, and even fascination of many of his students. He had developed, too, a beautiful laboratory technique in which these same qualities of accuracy and precision came into play.

His students owe much to him as a teacher and guide. I know, for I went to him as a green, untutored, provincial boy to spend

the three most profitable years of my life in his laboratory.

Dr. Bogert has published some four hundred papers, about three hundred of which represent original work. Forty-two papers have been published on that dinitrogen hetrocyclic system, the quinazolines. Many of these represent work that has occupied one man's time for two years. I may say, then, that this work represented something in the order of eighty-four man-years. With characteristic thoroughness and system, he has developed that which looks to most of us to be a beautifully completed chapter, the Bogert Chapter of Organic Chemistry. But he probably can see a few more niches to fill.

Twenty-two papers have been published on that very interesting sulphur and nitrogen dihetrocyclic system, the thiazoles. This grouping of elements is found in the important primulin, thioflavin, and chloramine yellow dyestuffs, and recently it has been shown to occur in the B_1 vitamin.

In the study of these two classes of compounds, many interesting products were made. Various types of dyes were prepared in both groups and analogues of important drugs were produced, as for instance, certain analogues of cinchophen, arsphenamine, the opium alkaloid, papaverin, and many others. Throughout all these investigations, emphasis was placed on, and separate papers published about, the relationship of molecular structure to various properties, as odor, color, and even pharmacological effects.

THE SYSTEMATIC thoroughness of the man is constantly exhibited in his development of these two chapters on organic chemistry. Let me indicate one of many illustrations of this.

For the preparation of certain carboxy quinazolines, it was necessary for him to have 3-amino orthophthalic acid, the chemistry of which had been investigated very little. He had a graduate student work two years rounding out the chemistry of this product and its derivatives.

It hardly seems likely that those qualities of orderliness and precision which are so characteristic of the medalist were the actuating forces which started him to study the terpenes, for here it would appear that the classical rules of organic chemistry are frequently not followed. The bonds and radicals jump around in a most bewildering fashion. More probably he followed his

esthetic sense, for his love of the beautiful, whether objects of art or those of nature, is well known. It was less likely due to his sense of smell, although he has the most wonderfully developed olfactory organs. It was truly remarkable how he could detect a couple of whiffs of a cigarette across an eighty-foot laboratory through the keyhole into his office!

The study of odoriferous substances has occupied a great deal of his attention in recent years. Not content with the chemical study of these products, he investigated the history of their uses, their occurrence, the botany of the plants which produced them, and the effect of the climate and geographical condition on these plants. His beautiful flower gardens in Maine, and his membership on the Board of Managers of the New York Botanical Garden, as well as his sometime consulting editorship of the *American Perfumer and Essential Oil Review* (1926-1931), are pertinent here.

His lecture given at Columbia a few years ago on "Synthetic Organic Chemistry in the Study of Odoriferous Compounds" was replete with suggestions for future development.

Of the important contributions in this field there may be mentioned either synthetic or constitutional studies on the relationship of molecular structure to odor of the rose alcohols, the violet ketones, of musk, of cinnamyl compounds, with odors from hyacinth to cinnamon.

Many individual investigations have been made on drugs, pharmaceuticals, and antiseptic dyes. Activity in these lines may have been enhanced by his appointment as director of the research department of the American Manufacturers of Toilet Articles, a position which he held during the life of that and predecessor organizations.

RECENTLY he has entered two new fields. One, on the ionenes, which he showed could be prepared from the synthetic violet perfume, beta-ionone, and its homologues. This beta-ionone ring in combination with a certain conjugated carbon chain constitutes the all-important vitamin A.

The second new field is on the phenanthrene derivatives. As you know, this grouping is found in the carcinogenic hydrocarbons, in the bile acids, in the sex hormones, in the sterols and vitamin-D, in the typically narcotic alkaloids of opium, morphine,

and codeine, as well as in thebain and in the heart glucosides.

Time has not permitted giving more than this all too general account of the medalist's scientific accomplishments. It will not permit discussing his social science, humanitarian, and religious activities. But let us note his sometime connections with the Board of Criminal Science, of the Police Department of New York City (1925-26), with the Consulting Board of the Institute of Cancer Research, of Rutgers Theological Seminary (1903-13), and his long term as vice-president of the National Institute of Social Science.

He has had many honors bestowed upon him. Of his several degrees, the only one about which he boasts is the C.Q.D. awarded him some years ago by a group of chemists. Translated, it means "Doctor of Complicated Queerazolines."

We now come to those activities of the medalist which are particularly pertinent tonight in view of the aims and objectives of The American Institute of Chemists and the award of this medal. I refer to Professor Bogert's important influence in the development of the chemistry profession and its organizations, and to his services to his country as a citizen chemist.

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He was a promoter and organizer of The Chemists' Club of New York, which has been of a national and even international service to chemists.

He was elected president of the American Chemical Society for 1907 and again for 1908. Most of his time for two years was given to this organization. Under his guidance there began a rapid growth in the number of new local sections. He made a study of the Society's publications and recommended the separate issue of sections devoted to physical, organic, and industrial and engineering chemistry.

HE ALSO made a thorough analysis of other societies devoted to chemical interests, and from this study came the recommendation that divisions of the Society should be organized on a formal basis, with election of officers, who would be responsible for their program, and thus permit within the society an outlet for more specialized interests. Many of the foundation stones for the rapid development and broad influence of the Society were laid back in 1907 and 1908 by the medalist.

His services to organized chemistry have never ceased. As president of the Society of Chemical Industry of London, and of its American section in New York, as either member of important committees or president of a section at three international meetings, as member of many other foreign and American societies of chemists, and particularly as a longtime member of the Council and Board of Directors of the Society, his keen judgment and clear vision have been given freely for our service.

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Colonel Bogert's service to his country during the war has never been fully told. . . . As you know, shortly before America entered the war, the American Research Council was formed. Professor Bogert was asked to organize and act as Chairman of its Division of Chemistry and Chemical Technology. What a fortunate circumstance for the accomplishments of American chemists during the war! Due to his wide circle of friends and very extensive acquaintances, he was able to get acceptances from the best talent in the country for chairmen of thirty-two sub-committees covering every branch of chemical activities. . . . He recommended first making an inventory of the laboratories and research equipment, and research man-power and time, in order that **the** problem and **the** man could be brought together. Other wise plans were formed.

These committees, with a brilliant and eager personnel, concentrated on matters immediately related to national security and defense. Hundreds of urgent problems were assigned to the best qualified investigators wherever they were located throughout the country. Again, I repeat, we were fortunate.

This job of organization and far-sighted planning, early accomplished, and thoroughly done, spread its influence out through a thousand paths into America, so that when the time came there was at least a partially informed and highly enthusiastic army of chemists ready. With no thought of belittling the later splendid work of the Medalist nor the independent accomplishments of a hundred other talented men, I would select this as the most productive achievement of a chemist during the war.

As Lieutenant-colonel he was placed in charge of the Chemical Service Section of the National Army. The government officials and even the military were slow to learn the tremendous rôle of chemistry in modern warfare. You can note his influence in the

orders that began to flow from the war department, affecting the personnel and bringing coördination, order, and system to the chemical activities of war-time. Soon, in a considerable measure due to his efforts, this section was united with other laboratories and departments dealing with gas warfare into the Chemical Warfare Service. Thus a coördination of all the activities of gas warfare was effected. He was promoted to Colonel, placed in charge of the Relations Section and acted as a member of Executive Committee of the Headquarters Staff, and of a dozen other boards and committees.

Who can estimate the value of his deeds and influences to our country? Who can appraise their effect on the national esteem accorded chemistry and chemists?

The Institute has done well to honor Marston Taylor Bogert, for where is the man who has given so much of time, of energy, and of unusual talent to the cause for which it stands?

I am sure that you will forgive this bit of the personal, when I say to my Professor, to my Colonel, my function tonight brings to me no less pleasure than this evening brings to you.

The Industrial Research Chemist's Balance Sheet

By M. C. Taylor, F.A.I.C.

IN ONE'S hurried journey through this life it is well for him to pause occasionally and take account of his position as regards accomplishments, objectives and difficulties ahead. It seems appropriate to consider such an account as might be drawn up for the average industrial research chemist. Carrying the analogy to accounting a little further, one may group the various items under some of the headings used in financial statements, such as capital assets, liabilities, and income.

Capital Assets

A man's wealth can often be best measured by his income producing capacity. In the case of the research chemist this is based on his training and experience; these constitute his real assets.

Training for chemistry often starts as a young man's hobby.

Interest in chemistry must develop during or prior to the college course. Usually it develops before the age of twenty, so that chemical knowledge and methods of thinking are engraved deeply in the make-up of most chemists because of this early association. It is not necessary to describe the orthodox college course for chemists but its accomplishments may be summarized in three categories. It gives the chemist: First—A large body of knowledge and facts and the ability to reason scientifically from them. Second—A number of practical abilities with which he can immediately earn a living, such as, familiarity with laboratory technic, analytical ability and knowledge of engineering calculations. Third—A certain amount of ability in research or the finding of significant new facts.

In order to acquire this training the individual has spent four to seven years. The whole represents a very considerable asset whose value is too well understood to need any further elaboration.

One individual's experience is necessarily limited to relatively few specific fields. The nature of this experience is of grave concern to the young chemist. The question of how often a man should change jobs is one concerning which individual chemists have very definite but very divergent views. It is really a matter of how best to obtain breadth of experience. With a chemical manufacturer of any size it is possible to get a rather broad experience without changing employers and such experience is apt to be highly valued by that particular employer. The principle types of assets which experience gives are: First—Knowledge of particular industrial operations. Second—Ability to make machines operate, cells run, processes work—make practical things function. Third—Some degree of ability to work with, manage or serve other men. Fourth—A record of tangible accomplishments, such as paying processes, or improvements.

Liabilities

CHEMISTS and other scientists approach life from the basis of fact. They consider that the Utopian world is one in which all things are known and all decisions not only can but will be made with a slide rule. The chemist wishes to know the facts. Having obtained as many of them as possible he will substitute probable assumptions for the remainder and by reasoning arrive at a logical course of action. The conclusion will then

appear crystal clear and impelling while the assumptions on which it is based will grow dim in the memory. Suppose that we grant that the conclusion is most probably correct, even so, action which is contrary to this logical deduction may not result in failure at least for a long time. Meanwhile many grists may be ground. Thermodynamics would deny life and have us all cold dust. Yet there is life and most of us approve of the inconsistency.

Many seek the ultimate in life not from the view point of fact but through continuous driving action. In this respect they may be likened to the minute nematodes in a drop of vinegar, never quiet but constantly wriggling on futile trips back and forth through the confines of their drop. To them action is life. Action is much a part of all life. Perhaps it is the ultimate in life but however that may be the industrial executive is commonly a man of action. He does not wish to pause long to weigh facts especially if they be of a nature which he does not understand. Action even with mistakes is more acceptable than no action.

The chemist is apt to view with contempt any action which does not follow a logical course. He does not understand it and often proceeds to wash his hands of the whole matter. But the man of action sees things differently; he has other information which he loosely thinks of as facts which along with the chemist's factual picture determines his course of action. This information may be a rumor of a new discovery, knowledge of an approaching bankruptcy, or only a worried look on the face of his business adversary.

It is not the purpose of this discussion to compare the relative merits of these two viewpoints but only to point out that lack of appreciation and understanding of the viewpoint of the man of action is a liability common among chemists.

Another liability which a chemist's worship of facts often creates is indecision as to what action to take. This may be due to a nearly even balance of pros and cons or due to the absence of fact on which to base a decision. Decisions in the absence of fact are peculiarly necessary in research. Suppose that research has been proposed on two new products unrelated directly to each other. The methods of manufacture may be only vaguely known. Probably nothing is known of sales volume or price. The research director may study one product or the other or divide his available funds and take twice as long to get anywhere on either.

The decision may be far reaching in its effects and it cannot be postponed. Such decisions as this must be made by the chemist with assurance even though they are in almost complete absence of fact and are based mostly on intuition, otherwise in industry they will be made by others less qualified than the chemist.

The incompleteness of this discussion of liabilities and assets may be excused, if it is considered that the items which have been mentioned are fundamental and represent the basis from which spring most of the other matters which could be mentioned.

The Income Account

THE FOLLOWING remarks on income refer in particular to the industrial research chemist. In research the chemist's task is to discover the proper relations between his employer's business and the great body of science as it comes to him from his education, experience, and reading of current journals. He must understand the technical limitations of his employer's processes, the economics of the industry including the costs of his employer's process and to as great an extent as possible, those of the competitor's process. By a study of current patents, attendance at scientific meetings, study of new scientific developments and general reading in divers fields he must become aware of trends in technology at the earliest possible moment.[5] But this is not sufficient, for at best his employer can then only imitate others. He must go further down into the elements from which real invention springs—further into science, grasp more quickly the significance of new facts as they emerge from the unknown. The recognition of a need is a very important element of invention. The research chemist must study the needs of industry, of agriculture, of men in general. Industrial research is now usually done by rather large groups and the ideas of the individual must be subordinated to the interest of the whole. But the act of invention is still largely a mental process. To be sure, certain data or observed phenomena may make the invention apparent, but usually the securing of these data was prompted by the hope of just such an invention as occurred. Invention is an individual matter. The individual must use his imagination to pass ideas in a planful manner before the critical eye of his experience and by this process form a concept which did not exist before. He must then use his knowledge and constructiveness to work out

the concept and his courage, determination and perseverance to see it through. In group work inventions usually dovetail together. First there is the general idea of doing work in the particular chosen field. This is very important even though in itself it may not be patentable. Next come ideas of just how to approach the field,—what type of process and the principal uses of the products. Later come improvement ideas which may be necessary to push the proposition over the economic hurdles. Through all the work there is the requirement of skill in manipulation and analysis; also there are the requirements of patience, loyalty, faith in the result, hard work, and an adequate supply of money. The outcome may be a failure either technically or economically or both and all there will be to show for several years of effort and expenditure of money is a book of reports. Or the outcome may be a new process or industry which will serve a useful function for years.

NOW WITH this brief and somewhat incomplete survey of the individual research chemist's work let us consider his compensation. In the first place I wish to make clear that I am not trying to establish that research chemists as a class are underpaid. It is possible that they may be over-paid. But I do suggest that they are not properly paid. Take the case of a successful research which is producing revenue for the employer. Aside from congratulating himself on his good judgment in furnishing the funds he will feel rather generously disposed toward the men who perfected the process. They are, to use his words, "eligible for promotion". But the man he wishes to promote may be the scientist who made his contribution as a result of reading much technical literature and then smoking his pipe with his feet on the desk while he thought things over—a pastime not usually considered grounds for promotion. Or he may be the slight, somewhat pale fellow, with the hands of an artist, who observed a new precipitate in a test tube. Or he may be the mathematician-chemist engineer who figured out the design of a critical piece of equipment. Or he may be the spectroscopist who discovered what was causing all the trouble. Now to what position can he promote these men? He may need a new plant superintendent, a new sales manager, or a new research direc-

tor. But these men would be out of place and probably failures in these positions. Furthermore they would not want these positions except for the increased income. Of course there are chemists quite capable of filling such positions as mentioned but they are not necessarily the ones who would contribute most to new process development. The employer may next consider a salary increase without increased administrative responsibility. But such an increase must be very meager and in no way commensurate with the value of the new process or the salary scale will soon appear very distorted and as time goes on will probably be revised more on the basis of management responsibility or possibly seniority than on past accomplishment. Or the employer may increase the salary scale of the whole department or may be more liberal in his support of research projects. While these things may be justified they are no adequate answer to the question of the individual chemist's compensation. Increasing the salary scale may increase the cost of research to a point where the return will not justify it.

Research has many similarities to prospecting for mineral deposits. The terrain is the great body of scientific knowledge which is our heritage. The current journals and research are the outcroppings from which one must determine where to dig. Analysis, electrolysis, electric furnaces, for example, are the picks and shovels. The gold prospector is in a position to profit from his strikes. Should not the chemical prospector be in a similar position?

But what is his position? We may conveniently turn at this point to the survey made by Joseph Rossman and published a few months ago in the *Journal of Industrial and Engineering Chemistry*. Two hundred and one large companies sent specific information which showed that:

44% offered no reward
33% a cash reward or bonus
15% promotion or increase in salary
4% share of profits
4% royalty basis

It was apparent from the article that in the case of the cash reward either the invention was of little value or the reward was entirely inadequate. The amounts usually mentioned with a few significant exceptions were from $1 to $100. Although the article

was not specific, these exceptions probably include a few of the large corporations which are known to operate carefully considered systems of special compensation for creative work. Furthermore it was repeatedly mentioned that in the case of those employed to invent, the salary was the only compensation. The cash reward seemed to apply particularly to those who invented incidentally in connection with other work. In those cases where those employed to invent were given special rewards at all, the reward was usually a salary increase. Time is lacking for a further analysis of this interesting article, but one is struck by the divergence of the views expressed by those responsible for the compensation of research personnel. In many cases the quotations show that no careful thought has been given the matter.

Perhaps none is necessary. However, much corporate research costs too much for the results obtained. Corporate management should be brought to understand better the nature of research and the conditions under which it flourishes. Inventions cannot be bought on specifications. Compensation for creative work in research should be gauged by a method particularly suited to its nature. Invention or the conception of new developments is individualistic.

IT IS HERE suggested that the best adjustment to the situation is to assure all industrial research workers either in writing or by established policy that a percentage, possibly one to five percent of the profits or savings resulting from their creative work will be set aside as direct compensation to them in the event of successful research. Due to the fact that many research employees are young and without financial resources it would be necessary to pay a salary sufficient to maintain these men and their families in living conditions such that they can associate respectably with their friends, but salaries particularly of the better men would not need to be as high as they are now. This scheme would tend to reduce the cost of unsuccessful research. In the case of the successful developments it would reduce the cost in the early stages although it might be increased later on but the additional outlay would be required only after it had been produced by the research in question. This arrangement would make it possible for the researcher to increase his income without being "promoted" into an administrative position where he could not do

research. If he produced, then, due to his greater income, he would become partially independent of the whim of his employer and his later years would not be dependent on the altruism and paternalism of an employer whose identity or principles are ever subject to change. It would make of the job what it was in the first place and should continue to be, namely, an opportunity for accomplishment.

Such a system will require care and thought in administration; this is an objection. However, many simplifications can be made and still retain the principle; for instance, it need only apply to the major research activities and of these only the successful ones; it could be strictly limited to creative work while salaries would take care of all other meritorious research work; it would not need to consider compensation for executive responsibility which could be handled through the usual salary system.

It has been said that good research men are somewhat like artists in that they work because they like the game and not because of rewards in prospect. This is probably true but it is also true that lack of incentive may lead even a good man to mediocrity. Stability of position is desirable as it frees the imagination. But men are always inclined to take the course of least resistance. The necessity for activity in order to take advantage of incentives offered tends to breed invention.

A GREAT deal has been said about a chemist's money income. Emphasis should be placed also on the income of personal satisfaction and happiness which results from working in well equipped laboratories at work which is congenial. Of course not all chemists are reaping this type of income but probably the majority are or will be in the future. This portion of the income is very important. It is life and what is there to life but living?

In this discussion of the Industrial Research Chemist's Balance Sheet it is not the intention to present a pessimistic view. The criticism of existing conditions and suggestions for improvement have been given prominence because they are possibly more profitable subjects for discussion. The picture is quite the reverse of pessimistic. The Chemist's balance sheet is in a decidedly solvent condition and the outlook for dividends is steadily growing brighter.

Annual Meeting — 1936

THE Fourteenth Annual Meeting of The American Institute of Chemists was held at The Hotel Statler, Buffalo, New York, May 9, 1936.

As retiring president, Dr. M. L. Crossley spoke of the difficulties faced and overcome by the INSTITUTE in the past, and summarized the work done by various committees on such projects as adequate education for chemists, economic status of chemists, and provision for a bureau of appointments which will not only take care of employment but will also see that the individual obtains the position which he is best qualified to fill, regardless of whether he is employed.

On Niagara Falls Trip
Howard S. Neiman, Secretary; Marston T. Bogert, Medalist; Charles F. Smith, Jr., Retiring Chairman, Niagara Chapter.

Mr. Frank G. Breyer reported the activities of the Committee on Unemployment for Chemists and discussed plans to establish the committee as a permanent project.

Dr. Howard W. Post was appointed as a representative of The American Institute of Chemists to the Annual Meeting of the Canadian Institute of Chemistry to be held in June.

The following telegram was sent to Dr. Treat B. Johnson:

The members of the American Institute of Chemists in annual convention assembled in Buffalo send their warmest regards to their past president and best wishes for a speedy recovery. We miss you greatly.

During the morning sessions of the INSTITUTE, Dr. Breyer spoke on the problems of the unemployed chemists and urged the im-

portance of obtaining a complete report covering the chemical profession. Discussion brought out that the major part of the worth-while chemical achievements was made by men over thirty-five, which refutes the popular belief that a chemist is employable only if he is under forty. Dr. Toch pointed out that age has no relation to years, that chemists should be judged individually.

Dr. James H. Hibben emphasized the need of greater organization to achieve the INSTITUTE's objectives.

An inspiring talk on the practical organization and operation of new chapters was given by Dr. William J. Cotton. His paper will appear in full in a later issue of THE CHEMIST.

Dr. R. T. Elworthy, representing the Canadian Institute of Chemistry was introduced. He pointed out the similarity of the problems facing both the Canadian Institute and our Institute.

The need for mutual coöperation among all societies striving for the good of chemists was stressed by Dr. Marston T. Bogert.

The Niagara Chapter of the INSTITUTE received enthusiastic praise for the efficient manner in which the Annual Meeting was conducted, and also for its generous hospitality to visiting members.

Our New Officers

President

Maximilian Toch received the B.Sc. and LL.B. degrees from New York University, the Ch.E. degree from Cooper Union, and the Sc.D. from Peking University for his work on tung oil. Author of many books and articles on the chemistry and technology of paints; the painting of permanent pictures; paintings and restoration, he is a Fellow of the Chemical Society of London, a Fellow of the Microscopical Society (U. S.), and member of many other societies. He is also a Fellow of the Royal Pho-

tographic Society of Great Britain, and has received international recognition of his artistic photographs, in addition to his fame as an expert on paints and paintings. He was formerly professor of industrial chemistry at Cooper Union, honorary professor of industrial chemistry at the University of Peiping, and professor of the chemistry of artistic painting at the National Academy of Design. He is president of Toch Brothers, Inc., New York, N. Y.

Vice-President

Robert J. Moore majored in chemistry and chemical engineering at Columbia University, where he was instructor from 1917 to 1920. He is the author of many research publications on petroleum oils and paint and varnish chemistry. He is chairman of the American Section, Society of Chemical Industry, and past chairman of the Paint and Varnish Division of the American Chemical Society. He is active in the North Jersey Section of the American Chemical Society and has recently been elected president of the Suburban Membership of The Chemists' Club. He is development manager, Varnish Resin Division of the Bakelite Corporation, Bloomfield, N. J.

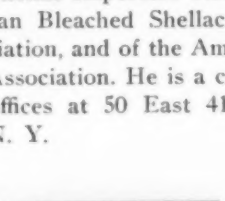
Secretary

Howard S. Neiman is a graduate of Lehigh University. He has written many papers on organic chemistry and coal-tar dyes, and he is also editor and publisher of the **Textile Colorist.** His wide background of practical experience, both domestic and foreign, in responsible positions and as chemical expert for industrial concerns, has particularly fitted him for his present occupation as patent attorney with offices at 233 Broadway, New York, N. Y.

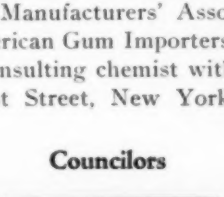
Treasurer

Burke H. Knight received the M.S. degree from the University of North Carolina. His specialty is shellac and its applications, and he is official chemist of the United States Shellac Importers' Association, of the American Bleached Shellac Manufacturers' Association, and of the American Gum Importers' Association. He is a consulting chemist with offices at 50 East 41st Street, New York, N. Y.

Councilors



Neil E. Gordon



Frank G. Breyer

Allen Rogers

Neil E. Gordon holds degrees from Syracuse University and the Ph.D. from The Johns Hopkins University, where he is professor of chemical education. He specializes in colloidal chemistry and editorial work, and he has written four text books for college chemistry, in addition to many technical papers.

Frank G. Breyer was graduated from Johns Hopkins University with the M.A. degree. He specializes in the metallurgy of zinc and its compounds, pigments, paint, rubber, and alloys and in these fields he holds more than fifty patents. He has contributed much to the profession through his work on the Chemists' Unemployment Committee. He is consulting engineer at 420 Lexington Avenue, N. Y. C.

Allen Rogers received the M.S. degree from the University of Maine, and the Ph.D. degree from the University of Pennsylvania. He specializes in leather and furs, has written several books and papers on these subjets. He is head of the Department of Chemical Engineering at Pratt Institute, Brooklyn, N. Y.

BOOKS

ANTOINE LAVOISIER, THE FATHER OF MODERN CHEMISTRY

By Douglas McKie, with an Introduction by F. G. Donnan
J. B. Lippincott Co.

A YEAR or so ago we had the pleasure in reviewing in these columns a life of Berzilius, in which the experimental difficulties, handicaps of equipment, and comparative poverty had to be overcome before the protagonist was able to carry on the work that has made his name immortal. Lavoisier had ample leisure, ample funds, and until the French Revolution was able to carry on experimental work which, to a large degree, forms the basis of modern chemistry. However, he lived at a time when politic and economic struggles affected directly the life of every resident of France, and finally resulted in the execution of Lavoisier under the decree of the Committee of Public Safety.

Dr. McKie has thus selected for his biography a man whose scientific as well as his public career were colorful in the highest degree, and in telling the story, both in the detailed descriptions of the experiments on which Lavoisier's contribution to chemistry were based, and the activities which finally brought about his death, the character is outstanding, definitive and thrilling. While the corruption of the times must be considered in weighing the character of any official, one wonders whether Dr. McKie was not mislead by his admiration for his subject in portraying him as entirely innocent on both financial and political grounds of the activities which lead to his sentence of death.

—*Karl M. Herstein, F.A.I.C.*

New Roster

The September issue of THE CHEMIST will contain a roster of the Institute membership. The roster will list the names, positions, and business addresses. This information will be taken from the recent "Qualification Questionnaire" which was sent out in April, and members are requested to make sure that they returned this questionnaire to the Secretary's office, or to send in any changes in position or business since that time.

ANNUAL REPORTS

Report of the Secretary

The Secretary is pleased to present this most satisfactory report to the members of THE AMERICAN INSTITUTE OF CHEMISTS, INC.

The following actions were taken by the National Council during the season:

Number of Council meetings during year	10
Average attendance at meetings	9

Elections

Fellows	132
Associates	23
Juniors	17
Students	6
Total	178

Loss of Membership

Resignations

Fellows	2
Juniors	4
Total	6
Fellows deceased	2
Fellows reinstated	3
Net loss	5

Present Membership

Honorary Members	7
Life Members	2
Fellows	645
Associates	103
Juniors	71
Students	9
Total	837
Fellows raised to Honorary Members	1
Associates raised to Fellows	5
Students raised to Juniors	1

Increase in Membership

Net increase in membership	173

A comparison of these figures with those of the season 1934-1935 presents some interesting facts indicating the rapid growth of the INSTITUTE during the past season.

The membership is larger than it has ever been. During the season of 1934-1935 there was a loss of 97 in membership, due to the fact that all delinquents were dropped from membership, while this year we show a gain of 173 members or an increase of 26%.

The credit for this increase in membership belongs almost entirely to the activities of the Membership Committee, under the untiring and energetic leadership of its Chairman, Dr. W. T. Read, and with the coöperation of the other members of the Committee. The methods adopted by this Committee are still operating, and it is believed that the results will bring the membership to at least 900 before the opening of the autumn activities.

This season has been conducted under the reduction of dues, which has had a beneficent effect upon the increase of members and especially upon the payment of dues — the delinquencies have been far less than at any other season in the INSTITUTE'S history—and in the decreased number of resignations, of which there were but six.

That the season has been a most active one is evidenced by the fact that the Secretary's office posted more than 18,000 pieces of mail, which do not include the regular issues of THE CHEMIST, which were mailed by the printer, and the Secretary wishes to take this occasion to express his deep appreciation of the loyal and faithful efforts of

his assistant, Miss V. F. Kimball, in furthering the interests of the INSTITUTE.

The Students' Medals which were instituted last season have met with enthusiastic reception by the universities and colleges, and we have thus far had recipients appointed by the following colleges: Columbia University, New York University, Fordham University, College of the City of New York, Polytechnic Institute of Brooklyn, Rutgers University, College of St. Elizabeth, Brooklyn College, Catholic University of America, University of Maryland, American University, Georgetown University, George Washington University, Howard University, Niagara University, and the University of Buffalo.

These means of building up a successful future for the INSTITUTE should be encouraged.

The Institute had a booth at the Chemical Exposition held in New York City on December 2 to 7, 1935, and it proved a most welcome rendezvous for the members, their friends, and strangers interested in its objectives.

The National Council has adopted an Institute Emblem, and it is hoped that the members will employ it as a badge of their membership.

The Jury on Medal Award has awarded the Institute medal to Dr. Marston Taylor Bogert for noteworthy and outstanding service to the science of chemistry and the profession of chemist in America.

Because of his absence from New York City, the Editor of THE CHEMIST, Mr. Alan Porter Lee, who has filled that office so successfully and satisfactorily, found it practically impossible for him to continue to occupy that position, and the National Council appointed Miss Vera F. Kimball as editor of this official organ of the INSTITUTE.

This season has been the most successful one in the history of the INSTITUTE and the outgoing officers, who have served it so faithfully, can view with pride and satisfaction the results of their efforts, and they bespeak for the newly elected officers the same helpfulness and interest in the welfare of the INSTITUTE that they have evidenced in the season now closing.

Respectfully submitted,

HOWARD S. NEIMAN, F.A.I.C.
Secretary

Preliminary Report of the Committee on Insurance

THE COMMITTEE on Insurance was appointed in order to study the possibility of devising ways to make the INSTITUTE useful to the profession by formulating plans to alleviate the economic hazards which are at present encountered by the individual chemist.

It was hoped that if a good plan could be worked out it might be adopted by the Chemical Industry as a whole. The difficulty in this, of course, is the large number of small industries employing few chemists per unit, and whose existence depends upon low costs in comparison with the larger companies which, in many cases, already have appreciated their responsibility. The avoidance of responsibility by industry, however, has recently compelled both Federal and State governments to assume the insurance of economic security. This has the advantage of bringing all industry into line; but, for the professional classes, the provisions are not adequate.

There are three lines of attack which can be made on this problem:

1. Extension and elaboration of governmental plans by proposals for legislative action.
2. Continued study of methods which might be adopted by the entire Chemical Industry.
3. Development of a working procedure for the INSTITUTE which should be a model for future adoption by either the Chemical Industry as a whole or by the government.

The last would appear to be the most logical method of procedure.

However, several difficulties have arisen.

Considering the four proposed objectives, life insurance, health insurance, unemployment insurance, and annuities, we have been advised by insurance counsellors that an association which depends upon the voluntary fees of its members cannot be given group insurance as in industrial organizations. This is primarily because there is no simple mechanism for the guaranteeing of payment of premiums such as the deduction from payroll. Essentially, therefore, any arrangement with an insuring agency would seem to be practically with the individual, with few advantages from his membership association. One advantage appears to be that members under 50 may obtain insurance without medical examination. However, as probably a relatively large proportion of the members would normally not be handicapped by an examination, it is doubtful if this provision would appeal to the membership at large.

An expert in the field of insurance studied the situation and recommended a combination of Group Life Insurance with Unemployment Insurance, which would operate to give insurance protection as well as pay-envelope protection to participating members.

Grade	*Life Insurance*	*Price of Membership*
Junior	$2000	$25
Associate	$2000	30
Fellows	$3000	60
Fellows	$5000	90

The unemployment benefits to be paid to members out of work would vary from $10.00 per week for five weeks to $25.00 per week for ten weeks, depending on the classification. These latter benefits would commence after two years of accumulation.

Whether or not there would be sufficient attractiveness in a proposition of this kind to interest any great number of members is difficult to say. Any compulsory fee of the magnitude suggested and applied to the entire membership would probably discourage many old as well as new members. Also because a large proportion of the present members have already protected themselves individually, it is not known how many would wish to take additional insurance.

From the viewpoint of making membership in the INSTITUTE attractive, a suggestion of Mr. Breyer is very interesting. This is for the INSTITUTE to secure sufficient funds to endow a laboratory with enough equipment so that members who had been in good standing over a definite period might have some place to work after retirement.

We shall be grateful to the Council if they will advise us on the following questions:

1. Shall the Committee concentrate on developing a program for legislative action, for the Chemical Industry, or for the INSTITUTE only?
2. Should the Committee be merged with that on unemployment so that the broader aspects of the economic hazards can be considered in common?

3. Should the membership be sent a questionnaire to determine what proportion feel it desirable to set up a mutual benefit system for health, life, or unemployment insurance?

Respectfully submitted,
—G. M. J. MACKAY, F.A.I.C.
Chairman

Report of the Committee on Membership

THE COMMITTEE presents the following report. Due to the fact that our members are widely scattered, it was not possible to hold a regular meeting of the committee. The chairman discussed the problem of increasing our membership with some members of the Committee, and corresponded with others.

Our first recommendation, based on the experience of a number of Fellows of the INSTITUTE, was that the dues be lowered. This recommendation was adopted by the Council.

The response to the membership campaign has been gratifying. The lists of those elected have appeared each month in THE CHEMIST.

Your committee feels that very little additional progress can be made until the AMERICAN INSTITUTE OF CHEMISTS undertakes a definite and active program of service to the profession consisting of several carefully planned projects. It is not the function of this committee to determine the nature of such projects, but we can pass on to the Council such suggestions as we have received in our work.

It has been suggested that we work out a policy similar to that recently adopted by the Engineering Societies in their Council for Professional Development, which aims to select and coöperate in completely training members of the profession.

One chapter has made a beginning in this type of work by sponsoring a program for high school and college students at which the training, work, and opportunities of the chemical profession were discussed.

The problem of a permanent organization to cope with the shifting employment situation is an immediate one. Whatever projects are undertaken, the suggestion has been made that we invite the coöperation of chemists generally.

Another field that needs development is that of the younger chemists. College and university teachers, particularly those who are known to take a great interest in their students, should be asked to submit names of their best and most promising graduates of recent years. These names should be used in a campaign to bring in Junior and Associate members.

Respectfully submitted,
W. T. READ, F.A.I.C.
Chairman

Report of the Niagara Chapter

A review of the activities of Niagara Chapter during the past year must recognize accomplishments in three directions. First, the chapter as a whole continued its efforts to further the aims of the INSTITUTE, and has maintained throughout the year the interest and enthusiasm of its members toward meetings and special activities. Second, the standing committees have carried forward various programs for the benefit of the profession and of the individual chemists of our district. Third, special committees aided by the

entire membership of the chapter have made the necessary arrangements for the annual meeting of the INSTITUTE.

Niagara Chapter met four times during the fiscal year, the summer meeting being held in conjunction with a most enjoyable outing and corn roast which was graced by the presence of the ladies, and which took place at the delightful summer home of Doctor Burwell on Lake Ontario. The two winter meetings, one at Niagara Falls and one at Buffalo, were devoted to round-table discussions of topics of professional interest. The spring meeting was addressed by a member of the staff of the U. S. Weather Bureau, who is located at the Buffalo Airport, and who described in a most interesting manner the various ways in which the Weather Bureau aids aviation. At these meetings, the chapter had as its guests several chemists of this locality who seemed to possess the qualifications of membership in the INSTITUTE.

The standing committees have functioned with varying degrees of success. The committees on Professional Ethics, Welfare, Publicity, and Education performed the duties indicated by their respective titles, and carried out other constructive work. That the numerical strength of the chapter has not increased more sharply is not discouraging, because a number of prospects have been "pledged" and members of the committee now living in St. Louis and Detroit report progress toward the organization of chapters in those large industrial centers. The new Committee on Public Relations has pointed out several distinct ways in which the chapter and its individual members can elevate the profession in the eyes of the general public. The Grosvenor Library Advisory Committee has rendered a genuine service both to the INSTITUTE and to chemists of this area by prevailing upon the directors of that great reference library to submit lists of new books on chemical and allied subjects to the entire membership of Niagara Chapter for advice as to the most suitable selections for purchase by the library.

Particularly during the past few months, planning and arranging the details of the annual meeting of the Institute has occupied considerable time and attention. Two of our chapter members are serving on the Committee for Arrangements appointed by the President of the national organization; and practically every member of the chapter has assisted in making the local arrangements and in securing advertisements for the special Buffalo issue of THE CHEMIST. No effort has been spared to make the meeting a success, and it is hoped that those directing the affairs of the INSTITUTE will see fit to hold future meetings in Buffalo or other large industrial centers.

The recipients of the Student Medal and one year's Junior membership in the INSTITUTE are Arthur S. Hellin, a senior at Niagara University, and Arthur C. Fluekinger, a senior at the University of Buffalo. Both men have majored in chemistry and were selected on the basis of scholarship and other characteristics indicative of sterling qualities.

The boundaries of Niagara Chapter have been extended to include Rochester and several smaller industrial centers within a radius of seventy-five miles of Buffalo. Erie, Pennsylvania, is not included, but chemists in that city are showing an interest in the INSTITUTE and are planning to visit Buffalo to attend the next meeting of the Niagara Chapter.

The financial position of the chapter is satisfactory and no difficulty is anticipated in carrying on the normal ac-

tivities of the organization. The membership now numbers thirty-one, including associates and juniors.

Niagara Chapter is working in complete harmony with the local section of the American Chemical Society, cooperating in the programs and activities of the Western New York Section and receiving in return the assistance of the Section in publicity through the *"Double-Bond,"* its monthly publication.

The Chapter wishes to express its appreciation of the sympathetic reception accorded its requests by the Council of the INSTITUTE and its very sincere thanks to the INSTITUTE for designating Buffalo as the place for the annual meeting.

Respectfully submitted,

CHARLES F. SMITH, JR., F.A.I.C.
Retiring Chairman.

Report of the Washington Chapter

To date the Washington Chapter of THE AMERICAN INSTITUTE OF CHEMISTS has held three meetings during the 1935-1936 season. A fourth meeting at which officers will be elected is scheduled for May 15th. At the first, meeting, Dr. S. B. Hendricks of the Bureau of Chemistry and Soils addressed the Chapter on "The Contributions of X-rays to Chemistry." His talk was very informative and provoked a lively and prolonged discussion. The second meeting was addressed by Dr. H. M. Johnson, professor of psychology at American University on "Science and Sorcery in Mental Tests." The third meeting consisted of a trip to Baltimore where the Washington members were joined by the Baltimore contingent for an inspection trip through the Baltimore Copper Works, followed by an informal group dinner and program. This meeting was well attended.

The Washington Chapter increased its membership considerably during the past year, due mostly to a determined campaign to get back old members who had dropped out.

Plans are underway for the awarding of student medals at six local universities.

The chapter has sufficient funds on hand for present needs.

Respectfully submitted,

COLIN W. WHITTAKER, F.A.I.C.
Retiring Chairman.

Report of the Editor of THE CHEMIST

THE CHEMIST this season has attempted to bring about closer contact between the membership and the Council. To this end, the minutes of the National Council have been reported in full detail and Chapter activities have appeared as they have been received. The INSTITUTE's news and announcements have been given prominence. The Councilors have written editorials, each bearing a special message to our members.

The form of THE CHEMIST has been altered slightly, and the INSTITUTE's emblem has been introduced as a marker between paragraphs and as a part of the cover design. We are indebted to Dr. D. D. Berolzheimer for the design of the emblem and for its applications.

We have been fortunate in having articles of exceptional merit which have brought many letters of interest or requests for extra copies. New de-

partments are "Chemists Abroad" and "The Walrus and the Carpenter," both of which have been favorably received.

The mailing list of THE CHEMIST has been increased more than 35 per cent.

The importance of THE CHEMIST as an advertising medium is beginning to be more generally recognized, and advertisers are beginning to take advantage of the buying power of our superior type of reader. THE CHEMIST has had more advertising this year than ever before.

THE CHEMIST welcomes articles of a professional nature or those developed from the professional point of view. News of members' activities, professional data concerning the chemical industry, or letters of discussion, are also sought. THE CHEMIST is always receptive to suggestions for its improvement.

The Editor is sincerely grateful for the generous assistance given by the Council, Dr. D. D. Berolzheimer, Mr. and Mrs. D. H. Jackson, Mr. Alan Porter Lee, Dr. J. N. Taylor, Miss Florence E. Wall; by the Chairmen of the Chapters, by Mr. R. B. Deemer and Mr. A. L. Hall, reporters to THE CHEMIST from the Washington and Niagara Chapters, by the Niagara Chapter for its assistance with the "Annual Meeting" issue, and by all who contributed. Particularly is the Editor grateful to Dr. M. L. Crossley and Mr. Howard S. Neiman, for their unfailing patience and unselfish cooperation.

Respectfully submitted,

V. F. KIMBALL,

Editor.

Report of the Treasurer for the Year May 1, 1935, to May 5, 1936

By ALAN PORTER LEE, F.A.I.C., *Retiring Treasurer*

Annual Statement

Income and Expense Account — May 1, 1935-May 5, 1936.

Income

Cash Balance, May 1, 1935		$ 550.16
Receipts:		
Dues	$3,643.25	
Advertising	2,304.36	
Subscriptions	84.90	6,032.51
Total Income for Year		$6,582.67

Expenditures

General		
Rent	$ 618.56	
Salaries	1,889.00	
Stationery, Telephone, Postage, Supplies, printing, Miscellaneous	932.38	
Refunds to Chapters	155.42	
Annual Meeting 1935	25.83	$3,621.19
The Chemist:		
Printing	1,390.46	
Miscellaneous — Commissions, etc.	1,200.18	$2,590.64
Total Expenditures for year		$6,211.83
Cash Balance, May 5, 1936		$ 370.84

COUNCIL

OFFICERS

President, MAXIMILIAN TOCH
Vice-President, ROBERT J. MOORE
Secretary, HOWARD S. NEIMAN
Treasurer, BURKE H. KNIGHT

COUNCILORS

ROSS A. BAKER
FRANK G. BREYER
HANS T. CLARKE
M. L. CROSSLEY
NEIL E. GORDON
HENRY G. KNIGHT
W. T. READ
ALLEN ROGERS
NORMAN A. SHEPARD
WALTER T. TAGGART
FREDERICK W. ZONS

CHAPTER REPRESENTATIVES

New York	*Niagara*	*Philadelphia*	*Washington*
LLOYD VAN DOREN	ARTHUR W. BURWELL	C. W. RIVISE	C. W. WHITTAKER

April Meeting

The one-hundred and thirty-first meeting of the Council of THE AMERICAN INSTITUTE OF CHEMISTS was held at The Chemists' Club, 52 East 41st Street, New York, N. Y., on April 16, 1936, at 5:30 P. M.

In the absence of President Crossley, and upon motion made and seconded, Dr. Henry G. Knight was appointed chairman pro tem.

The following councilors and officers were present: Messrs. R. A. Baker, F. G. Breyer, H. G. Knight, A. P. Lee, H. S. Neiman, W. T. Read, L. Van Doren, F. W. Zons, and Miss F. E. Wall. Dr. Max Trumper was present as representative of the Pennsylvania Chapter. Miss V. F. Kimball was also present.

The minutes of the previous meeting were approved.

Upon motion made and seconded, the design and drawings of the INSTITUTE pin and key were approved, with the suggestion that the emblem within the circle be of burnished gold instead of green enamel.

A letter from the Coördinator for Industrial Coöperation, Washington, D. C., was read, and upon motion made and seconded, the Secretary was requested to send it to the chairman of the Annual Meeting Committee with power to act.

A letter from the Washington Chapter regarding the recently appointed Committee on Constitutional Revision was read, and upon motion made and seconded, the Secretary was requested to refer the letter to that committee.

Upon motion made and seconded, the INSTITUTE was authorized to order one dozen pins and one dozen keys. These are to be made up and sent to INSTITUTE members by the C. G. Braxmar Company, as ordered, upon presentation of a card of authorization from the Secretary.

A letter from the National Commit-

tee to Further Propaganda for the Sale of American Made Merchandise was read and the Secretary was requested to notify this organization that the matter is being taken under advisement.

The Committee on Membership reported on its activities and also made the following recommendations: (1) That the INSTITUTE contact the university professors and interest them in suggesting names of their graduate students for Associate membership. (2) That centrally organized projects be started in various cities, and that non-members of the INSTITUTE be invited to assist in carrying them out.

A letter from M. R. Bhagwat regarding the work of the Committee on Unemployment and Relief for Chemists was read, and the Secretary was requested to reply that the matter would be discussed at the Annual Meeting.

The Committee on Honorary Membership made the following recommendations: (1) That there should not necessarily be a connection between medalists and honorary members. (2) One honorary member a year should be elected. (3) For honorary members, we should select those who also conform to the requirements for INSTITUTE Fellowship. Upon motion made and seconded, the recommendations of the Committee were accepted.

Upon motion made and seconded, it was decided to adopt the standard form of ballot for future elections.

Upon motion made and seconded, W. L. Obold was raised from Associate to Fellow.

The following new members were elected:

FELLOWS

STUART R. BRINKLEY, *Associate Professor*, Yale University, New Haven, Conn.

RALPH T. K. CORNWELL, Sylvania Industrial Corporation, Fredericksburg, Va.

JOHN J. DONLEAVY, *Assistant Professor*, Yale University, New Haven, Conn.

ALFRED WEST FRANCIS, *Research Chemist*, Socony-Vacuum Oil Company, Paulsboro, N. J.

LAUDER W. JONES, *Professor*, Princeton University, Princeton, N. J.

J. C. HOSTETTER, *Director Development and Research*, Corning Glass Works, Corning, N. Y.

JOHN F. KING, *Professor of Chemistry*, Thompson Chemical Laboratory, Williams College, Williamstown, Mass.

P. G. I. LAUFFER, 9 Ashley Road, Hastings-on-Hudson, N. Y.

S. LENHER, *Research Chemist*, E. I. duPont De Nemours & Company, Inc., Wilmington, Del.

L. R. LITTLETON, Emory and Henry College, Emory, Va.

VITTORIO MOLINARI, *Chemist*, River Road, Box 3A, Bound Brook, N. J.

LEROY V. STRASBURGER, *Analytical & Consulting Chemist*, 15 South Gay Street, Baltimore, Md.

ASSOCIATE

ALFRED R. BAYER, *Chemist*, 191 St. James Place, Brooklyn, N. Y.

The Secretary reported on the present condition of the membership, and that another letter is being sent to delinquents.

The Treasurer's report was accepted.

Upon motion made and seconded, President Crossley was requested to appoint an audit committee to audit the books for the annual meeting.

The Committee on Insurance reported progress.

There being no further business, adjournment was taken.

May Meeting

The one-hundred and thirty-second meeting of the Council of THE AMERICAN INSTITUTTE OF CHEMISTS was held at the Hotel Statler, Buffalo, New York, on May 9, 1936, at 12:30 P. M.

President M. L. Crossley presided. The following officers and councilors were present: Messrs. F. G. Breyer, A. W. Burwell, M. L. Crossley, H. S. Nieman. Dr. Maximilian Toch; Mr. J. H. Hibben representing the Washington Chapter; Mr. B. H. Knight representing the New York Chapter; Dr. Marston T. Bogert, INSTITUTE medalist; Dr. R. T. Elworthy representing the Canadian Institute of Chemistry, and Miss Vera F. Kimball were also present.

The Secretary read a letter from Miss Florence E. Wall expressing her regret that she could not attend the meetings, and conveying best wishes. On motion made and seconded, the Council extended to her its appreciation of her work as Councilor.

The Secretary read an announcement by the Niagara Chapter that student medals had been awarded to Arthur C. Fluekinger of the University of Buffalo, and Arthur S. Hellin of Niagara University.

The election of the following new officers and councilors was announced: President, Maximilian Toch; Vice-president, Robert J. Moore; Secretary, Howard S. Neiman; Treasurer, Burke H. Knight; Councilors, Allen Rogers, Frank G. Breyer, and Neil E. Gordon.

The Secretary read a letter from R. C. Wilbur, regarding the formation of a chapter of the INSTITUTE in the St. Louis district, and Mr. Breyer and Dr. Toch offered to keep this in mind, should their businesses take them to that section.

The Secretary announced that Student Medal Awards have been offered to the following colleges by the various chapters:

New York Chapter

Columbia University
College of the City of New York
College of St. Elizabeth
Polytechnic Institute of Brooklyn
Fordham University
New York University
Brooklyn College
Rutgers University

Washington Chapter

The George Washington University
The American University
The Catholic University of America
Georgetown University
University of Maryland
Howard University

Niagara Chapter

Niagara University
University of Buffalo

The following new members were elected:

FELLOWS

RALPH T. CASSELMAN, *Research Chemist*, The Bakelite Corporation, Bloomfield, N. J.

JOHN D. CLARK, *Professor*, Department of Chemistry, The University of New Mexico, Albuquerque, N. M.

ARTHUR C. FLENTGE, *Chief Chemist*, The Mentholatum Company, Inc., Buffalo, N. Y.

N. HOWELL FURMAN, *Associate Professor*, Frick Chemical Laboratory, Princeton University, Princeton, N. J.

J. SAM GUY, *Professor of Chemistry*, Emory University, Emory University, Georgia.

C. C. HEDGES, *Head of Department of Chemistry and Chemical Engineering*, Agricultural and Mechanical College of Texas, College Station, Texas.

FREDERICK A. HESSEL, Ritter and Company, 48 Wall Street, New York, N. Y.

NORBERT A. LANGE, *Lecturer in Organic Chemistry*, Western Reserve University, Cleveland, Ohio.

LUTHER M. LAUER, *Research Chemist*, National Aniline and Chemical Company, Buffalo, N. Y.

CARL W. LINDOW, *Research Chemist*, Kellogg Company, Battle Creek, Mich.

ERNEST LITTLE, *Dean*, N. J. College of Pharmacy of Rutgers University, Newark, N. J.

F. MARION LOUGEE, *Professor of Chemistry*, Keuka College, Keuka Park, N. Y.

ICIE G. MACY, *Director Research Laboratory*, Children's Fund of Michigan, Detroit, Mich.

GEORGE P. MEADE, Colonial Sugars Company, Gramercy, La.

BENJAMIN A. MERIGOLD, *Director*, Chemical Laboratories, Clark University, Worcester, Mass.

MARTIN MEYER, *Acting Chairman of Department of Chemistry*, Brooklyn College, Brooklyn, N. Y.

H. P. NEWTON, Bureau of Chemistry and Soils, Washington, D. C.

J. A. NIEUWLAND, Department of Chemistry, University of Notre Dame, Notre Dame, Ind.

EARL FRANCIS OGG, *Assistant Chemist*, Wilson Dam, Alabama.

W. B. PARKS, Kansas State Teachers College, Pittsburg, Kansas.

FRANK H. POLLARD, The Clemson Agricultural College, Clemson College, S. C.

E. J. QUINN, The Maltine Company, Brooklyn, N. Y.

RUFUS D. REED, *Associate Professor Chemistry*, New Jersey State Teachers College, Montclair, N. J.

E. W. REID, *Senior Industrial Fellow*, Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Penna.

LLOYD K. RIGGS, *Director of Research*, Rutgers College of Pharmacy, Newark, N. J.

ISRAEL ROSENBLUM, *President*, Paramet Chemical Corporation, Long Island City, N. Y.

WILLEM RUDOLFS, *Professor*, Rutgers University, New Brunswick, N. J.

WILLIAM SEAMAN, *Chemist*, Calco Chemical Company, Bound Brook, N. J.

WILHELM SEGERBLOM, Department of Chemistry, The Phillips Exeter Academy, Exeter, N. H.

LEE I. SMITH, School of Chemistry, University of Minnesota, Minneapolis, Minn.

FREDERICK J. SQUIRE, *Assistant Chief Chemist*, Lever Brothers Company, Cambridge, Mass.

HARRY STEENBOCK, College of Agriculture, University of Wisconsin, Madison, Wis.

KARL T. STEIK, National Oil Products Company, Harrison, N. J.

J. K. STEWART, Anderson-Prichard Oil Corporation, Oklahoma City, Okla.

JOSEPH J. SULLIVAN, Department of Chemistry, Holy Cross College, Worcester, Mass.

MARGARET C. SWISHER, *Assistant Professor in Chemistry*, University of Buffalo, Buffalo, N. Y.

HARDIN F. TAYLOR, *President*, The Atlantic Coast Fisheries Company, New York, N. Y.

J. J. THOMPSON, Room 4A, Post Building, Battle Creek, Mich.

WALTER E. THRUM, *Head of Department of Chemistry*, Valparaiso University, Valparaiso, Ind.

HARRY C. TRIMBLE, *Assistant Professor*, Harvard Medical School, Boston, Mass.

ROGER W. TRUESDAIL, *Director*, Truesdail Laboratories, Inc., Los An-

geles, Calif.

CHARLES E. WATERS, *Research Chemist,* Johns-Manville Research Laboratories, Manville, N. J.

HENRY J. WING, *Research Chemist,* E. I. du Pont de Nemours & Co., Parlin, N. J.

LULU GAINES WINSTON, Meredith College, Raleigh, N. C.

PAUL JOHN WITTE, *Assistant to Technical Director,* Lucius Pitkin, Inc., New York, N. Y.

ASSOCIATES

DAIL C. LACRAFT, *Chemist,* Experimental Laboratory, Shell Petroleum Corporation, Roxana, Ill.

THEODORE G. ROCHOW, *Chemical Microscopist,* American Cyanamid Company, Linden, N. J.

Upon motion made and seconded, it was decided to make the September, 1936, issue of THE CHEMIST a roster of the membership.

Upon the suggestion of the Niagara Chapter representative, motion was made and seconded that the INSTITUTE formulate a definite policy for the guidance of the Chapters.

There being no further business, adjournment was taken.

CHAPTERS

New York

Chairman, BURKE H. KNIGHT *Vice-chairman,* JEROME ALEXANDER

Secretary-treasurer, WALTER J. BAEZA

52 East 41st Street

New York, N. Y.

Niagara

Chairman, GROVES H. CARTLEDGE *Vice-Chairman,* HOWARD W. POST

Secretary-Treasurer, WILLIAM R. SHERIDAN

1439 Kenmore Avenue

Kenmore, New York

News Reporter to THE CHEMIST, ALBERT L. HALL

March Meeting

The fourteenth regular meeting of the Niagara Chapter was held March 6, 1936, with a dinner at Buffalo Consistory.

The Committee on Professional Ethics, M. C. Taylor, Chairman, reported no business on hand, but suggested that members give some thought to formulation of topics for discussion at some future meeting.

The report of the Committee on Professional Education was read by the Secretary. The report embodied certain suggestions relative to an expansion of the Resolution concerning the Student Membership Award which reads as follows:

"WHEREAS, the AMERICAN INSTITUTE OF CHEMISTS has for one of its objectives the encouragement of both chemists and the public in looking upon chemistry as a profession, and

WHEREAS, there is a mutual interest to be served in bringing the INSTITUTE and the educational institutions into coöperation, therefore

BE IT RESOLVED, that the Niagara Chapter of THE AMERICAN IN-

STITUTE OF CHEMISTS hereby establishes annual awards consisting of one year's student memberships in the INSTITUTE and in the Chapter, the award to be made in accordance with the following provisions:

1. The Chemistry Department of each of the accredited colleges and universities situated within the area embraced by the Chapter in the State of New York shall be asked to nominate, by March first of each year, one Senior student as a candidate for the award. The term, Senior student, is intended to mean a student who is a candidate for a Bachelor's degree major in chemistry within the twelve months after the date set for the submission of nominations.

2. The nomination of a candidate from one of the above mentioned colleges or universities shall be considered tantamount to election.

3. The candidates shall be the guests of the Chapter at its May meeting and the Student Membership shall date from May first.

Moved that the words "within the area embraced by the Chapter" be substituted for "Erie and Niagara Chapters". Seconded and carried unanimously. Moved that the Chapter ask for the approval of the National Council to an extension of the area covered to embrace all of New York State lying west of a line running due north and south passing through the eastern boundary of the city of Batavia. Carried unanimously.

It was moved and seconded that the resolution be amended to embody the words "major in chemistry". Motion carried.

The Welfare Committee, G. H. Cartledge, Chairman, reported continued functioning as a clearing house for jobs in the area. In connection with the present provisions of the Security Act, Dr. Cartledge mentioned a rather objectionable feature in that employers were now obliged to pay a certain stated sum upon hiring a man, for instance a chemist, irrespective of the proposed length of his employment. Thus the summer employment of college students might be seriously curtailed. Upon motion made and seconded, the Secretary was instructed to ascertain from the national organization what lies behind this situation and what can be done about it.

The Publicity Committee, A. L. Hall, Chairman, reported progress toward putting out the series of newspaper articles and increasing the number of talks given by members before luncheon clubs, etc.

The Advisory Committee to the Grosvenor Library, W. R. Sheridan, Chairman, reported the list of books and periodicals under way at the Grosvenor Library covering the entire area. The library will ask various plants to what extent their files may be open to readers. The Grosvenor Library is open to suggestions as to new books and the membership of the Chapter will be circularized for this purpose.

The Nominating Committee was appointed by the Chairman to consist of M. C. Taylor, R. L. Perkins, and Carl Rasch. Moved, seconded and carried that the present officers hold over until after the annual meeting in Buffalo.

The following by-law was unanimously adopted: Article VIII, Amendments. Sec. 1. Amendments to the By-laws of the Chapter shall be made only at some regular meeting thereof and by a two-thirds vote of the members voting. Sec. 2. A copy of every proposition to amend shall be embodied in the call for the meeting at which it is to be acted upon and a copy sent to every member of the Chapter.

The Chairman summarized developments in preparation for the national meeting. The meetings will be held at the Hotel Statler. Saturday morning will be devoted to a number of papers. In the afternoon one or two papers of greater magnitude will be presented and the business session will begin at three o'clock. The banquet in the evening will be followed by the presentation of the INSTITUTE Medal. Excursions to the Falls on Sunday are planned. The matter was referred to the Committee on Visitation and Transportation. The Chairman appointed as the Committee on Visitation and Transportation, T. R. Milne, F. L. Koethen, and A. L. Shepard. The Chairman appointed T. R. Milne as the Registration Committee.

May Meeting

The fifteenth regular meeting of the Niagara Chapter was held at the Red Coach Inn, Niagara Falls, N. Y., Friday, May 1, 1936, at 6:30 P. M. Those present were Charles F. Smith (Chairman), Bramann, Brown, Burwell, Camelford, Cartledge, Hall, Hellin, Fluekinger, Perkins, Koethen, Lawton, Post, Rasch, Seubert, Sievenpiper, William A. Smith, Taylor, and the speaker of the evening, Mr. Emil Raab of the United States Weather Bureau.

After the dinner the Chairman called the meeting to order. The Secretary submitted a list of books made up by the Committee of Advisement to the Grosvenor Library.

The Chairman of the Committee on Professional Education, William B. Brown, introduced Arthur F. Fluekinger of the University of Buffalo and Arthur S. Hellin of Niagara University, winners of the recent Student Membership award.

Maurice C. Taylor presented the results of the balloting for chapter officers and announced the following elections:

Chairman, Groves H. Cartledge

Vice-chairman, Howard W. Post

Secretary-treasurer,
William R. Sheridan

Chapter Representative,
Arthur W. Burwell

A progress report was presented by Groves H. Cartledge bearing on plans for the coming national meeting of the INSTITUTE. Slips were passed around for signatures for reservations for the banquet, and for volunteers for the sight-seeing trips, Sunday, May tenth, and the plant visits Monday, May eleventh. W. A. Smith will arrange the trips. Moved by G. H. Cartledge, seconded by J. A. Camelford, that the Chairman of the Membership Committee be instructed to notify all members whose applications have not yet been acted upon that they are fully entitled to the privileges of the INSTITUTE during the national meeting. Motion carried unanimously.

The Chairman introduced the speaker of the evening, Mr. Emil Raab of the U. S. Weather Bureau, stationed at the Buffalo Airport, who gave a very interesting illustrated talk of weather forecasting as an aid to air navigation.

Pennsylvania

Chairman, MAX TRUMPER *Vice-chairman,* LOUIS D. NEWITT
Secretary-treasurer, CHARLES W. RIVISE
1321 Arch Street
Philadelphia, Penna.

Washington

Honorary President, CHARLES E. MONROE
President, COLIN W. WHITTAKER *Vice-president,* LOUIS N. MARKWOOD
Treasurer, JAMES H. HIBBEN
Secretary, FRANK O. LUNDSTROM
4012 Davenport Street, N.W.
Washington, D. C.
News Reporter to THE CHEMIST, R. B. DEEMER

April Meeting

The Washington, D. C., Chapter, on April third, joined the members of THE AMERICAN INSTITUTE OF CHEMISTS resident in Baltimore and enjoyed an inspection trip through the world's largest electrolytic refinery located in the outskirts of that city.

Through arrangements made by Dr. N. W. Matthews, The Baltimore Copper Works granted members and their friends the privilege of a detailed tour of the plant. The party was divided into small groups and opportunity was thus afforded for presentation of operation procedure and an explanation of technique that happened to be of particular interest to individual chemists. The entire afternoon was devoted to this instructive visit. The members met later in the evening for dinner and a brief business meeting. At the conclusion of the meal, Dr. Matthews reviewed the various steps of the process of the copper refinery and answered questions regarding details of the chemistry involved which gave the members additional opportunity to obtain a clear picture of the plant operation and made it possible for them to obtain information that had escaped their attention during the remarks of the chemical engineers who acted as guides for the parties.

Dr. S. M. Weisberg spoke informally upon his efforts to prepare vitamin concentrates from commercial products and mentioned the designing of an instrument for determining vitamins which he has developed and brought to successful use.

Dr. Warth spoke on a projected plan for closer and more frequent contact between Washington and Baltimore members and other chemists. His suggestions were received with enthusiasm.

The principal business discussed was the proposed change in the Constitution relative to membership requirements now being considered by the recently appointed committee on constitutional revision. The Secretary was instructed to inform the National Council concerning the general attitude of the members present regarding proposed changes.

Members and friends of the local Chapter attending the tour and dinner were: C. W. Whittaker, F. O. Lundstrom, J. D. Reid, A. R. Merz, E. F. Snyder, L. F. Rader, J. O. Hardesty, L. N. Markwood, A. L. Mehring, J. H. Hibben, D. T. Tremearne, A. L. Pitt-

man, J. J. Stubbs, D. F. J. Lynch, H. L. Marshall, C. E. Senseman, N. W. Matthews, and R. B. Deemer.

The group was joined at dinner by J. B. Martin and J. W. McBurney of Washington, and by A. H. Warth, Elsa R. Orent, Marguerite M. Schmidt and S. M. Weisberg, well-known Baltimore members of THE AMERICAN INSTITUTE OF CHEMISTS.

CHEMISTS ABROAD

By James N. Taylor, F.A.I.C.

IN HIS ADDRESS, as retiring president, to the annual general meeting of the INSTITUTE OF CHEMISTRY, Professor J. Thorpe, F.R.S. called attention to the scientist as company director. It was really an amazing fact that so few scientific people were on the board of directors of companies dealing with industries based on scientific methods. Only the other day, someone speaking after dinner to an audience of chemists said that no scientist should be on a board of directors because he would wreck the business within a week, the speaker's contention being that a scientific director would always be striving after something new, and would consequently scrap the older methods. His argument was evidently the old one—namely, that the best is the enemy of the good. Was it not amazing that anyone should be found in the twentieth century to give expression to such a specious argument?—*Chemical Trade Journal and Chemical Engineer* (*London*).

EXAMINATIONS for Associateship in the INSTITUTE OF CHEMISTRY will be held in London and Glasgow from September 14th to 19th. The list of entries will be closed on Monday July 6th. Examinations for the Fellowship will be held in London from September 21st to 26th. The list of entries will be closed on Monday, July 6th, except for candidates in Branch G, Industrial Chemistry, or for those desiring special examinations, whose applications should be received before June 1st.

A COURSE in the physical chemistry of glass has been established by the Faculty of Sciences of the University of Liége. The chair will be held by M. Pierre Gilard, engineer-in-chief of Cristalleries du Val-Saint-Lambert, well known for his brilliant labors upon glass.—*Chimie et Industrie* (*Paris*).

STATISTICAL data have just been made available regarding the activities of the Czechoslovak Patent Office during the calendar year 1935 according to *Consul John H. Bruins* (*Prague*). During that year, 7,590 applications for patents were made (7,938 in 1934), and 3,200 patents (3,700 in 1934) were granted. The largest number of patent applications was in the field of chemistry.

ACCORDING to the Bank of Japan's labor statistics covering about four thousand factories throughout the country, the number of factory workers in June 1935 totalled 1,026,000 showing an increase of 300,000 over the corresponding period of 1931. Classified by various branches of industry, the heavy industry showed an increase of 94 percent in the employment of hands; the chemical industry

an increase of 45 percent; the miscellaneous industries an increase of 37 percent; the fibre industry an increase of 30 percent, and the beverage and food industry 17 percent. The rate of wages per capita decreased by 14 percent as compared with the corresponding period. — *Chugai Shyogyo Shimpo* (*Tokyo*).

DR. E. F. ARMSTRONG, F.R.S. spoke at the Annual Dinner and Dance of the London Section of the British Association of Chemists, offering the toast "Chemistry and the British Association of Chemists." He felicitated the Association upon its growth and prosperity and wished it continued success.

Washington chemists remember with a great deal of pleasure the occasion of Dr. Armstrong's visit here in the Summer of 1932. Equally delightful for us at that time was the opportunity to meet Captain J. Davidson Pratt, also of London, and General Manager and Secretary of the Association of British Chemical Manufacturers. These gentlemen brought with them a spirit of high endeavor that was most inspiring and carried back to England the regard and best wishes of their "American cousins."

SOVIET RUSSIA commemorated the 100th anniversary of the birth of Mendeleeff by issuing a series of postage stamps portraying him seated and with the periodic table in the background. Other countries have recognized famous chemists in like manner, the Netherlands according philatelic honors to Boerhave and France to Pasteur and Berthelot. The stamp bearing Berthelot's likeness commemorated the centenary of his birth and the erection of the Institute of Chemistry in Paris.

It is surprising that among our eminent American chemists none has been recognized philatelically.

BRITISH CHEMISTS, suitably qualified in the detection and identification of gases, will be given specialist courses at the Civilian Anti-Gas School. A circular issued by the Home Office states, it is reported, that members of decontamination services should preferably be trained by instructors who have attended a course at the School. Trained instructors will be made available to local authorities for local instruction in civil air raid precautions.

PURCHASING as a profession for chemists and chemical engineers is suggested by *Canadian Chemistry and Metallurgy* (*Toronto*) for those who may not have become frozen in any form of chemical work. Although selling utilizes chemical training, purchasing has not as yet awakened to its opportunities to do so, probably due to an unwillingness on the part of the chemist to take an interest in anything other than those duties for which specific or professional training has prepared him.

Post-graduate training in business should not be held in lesser regard than graduate training in research, states the publication. The doctrine of a great need for chemists of the best training in industry presupposes the possession of a reasonable sense of need on the part of the latter. As we have no organized, or at least, no well-financed way of causing this to exist, it is slow to develop. If chemists expect business executives and plant managers to become interested in chemistry, they must learn to go half-way and concern themselves in the business as a whole.

"The time has come," the Walrus said,
"To talk of many things:
Of shoes—and ships—and sealing wax—
Of cabbages—and kings—"
The Walrus and the Carpenter

THE CARPENTER respectfully calls the following "gem" to the attention of H. S. N. and L. V. D.

A professor happened to stroll into a machine shop and he was amazed to see the strange devices all around him. He was so enthused with his subject that he gave his class the next day a very wonderful description of what he had seen. He had noticed one piece of apparatus in particular and had studied its construction and operation minutely. He described it to his class in these terms:

"It is absolutely astonishing to see the splendid work this machine will accomplish. I never dreamed there were such wonders right amongst us. This invention is so designed that by means of a pedal attachment, a fulcrumed lever converts a vertical reciprocal motion into a rotary or circular movement. The principal part of the machine consists of a huge, heavy circular disk which rotates in a vertical plane. Power is applied to the disk through its axial mounting. When the axis of the disk revolves, this causes the disk to be rotated, and—strange to say—when the speed of the axis is only very moderate, the periphery of the disk is traveling at a high velocity. Useful work is done on this fast-moving periphery. Pieces of the hardest steel are applied to the periphery, and by the mere impact of this refractory metal on the substance of the disk, the metal is actually worn away. In fact, the metal can be reduced to any shape which the skilled operator desires. In cases where such purpose may be the desired eventuality, an edge can be produced on a piece of steel which will be so keen and sharp that the utensil can be used for cutting wood or other materials—or in some cases even steel itself."

"What is the name of this rare and remarkable piece of apparatus?" inquired one student, who had listened with bated breath and round-eyed wonder.

"I believe they call it a grindstone", replied the professor.—*The Pathfinder.*

Congressional Chemistry

MR. BARKLEY, (Senator from Kentucky). Mr. President, the Senator is right about that. There are different sorts of alcohol. Plain alcohol is the parent of all the alcohol family, and going on down from the parent we get ethyl alcohol, which is the potable or consumable part of the alcohol family. Then we get butyl alcohol, depending upon the content. Then we get the methyl alcohol, and finally we get wood alcohol, and they are all traceable back to the parent of the whole alcohol family. Ethyl alcohol is the only sort of alcohol out of which whisky or gin or any of these other drinkable beverages is manufactured. Others are used for industrial purposes and for scientific purposes.

Congressional Record, May 19, 1936.

Some Utilities of SiO_2

We chemists are inclined to look very much to the purely chemical aspects of the bodies with which we deal; we pay too much attention to chemical and physical constants. Our brethren who deal more in the psychical fields sin in the same way.

In regard to such a well known substance as silicon dioxide, it is not hard to find in any textbook that one may pick up page after page describing its properties as regards this solution or that solution; its properties as a component of the silicates; its mineralogical aspects and whatnot. Its coefficient of expansion, looking at the physical side, has been determined over and over again; its translucency, its insulating power, etc., have all been determined to the *n*th decimal.

And yet its main utilities to man are hardly ever mentioned in our textbooks. The broader aspects of the relations of this substance, and indeed of that of many others, to the globe on which we live and to our daily life are not hinted at in our books.

To take one detail, nobody has even thought of it (so far as the literature with which I am familiar is concerned), yet it is obvious at once when it is pointed out that without silica the rotundity of the globe could not be preserved. Without silica in the form of sand or silicate of alumina or something of that sort the real estate business would vanish; there would not be a corner lot for sale to a rich chemist at an attractive price. One cannot throw a stone at a dog without the utilization of silicon dioxide. In the very act of hurling a dornick the hurler must have a subconscious knowledge of many of the details of the physical properties of silicon dioxide.

I wish to call the attention of chemists to the fact that we "do not see the woods for the trees"; we are too much occupied with the niggling specific details of the properties of the substances with which we deal and we do not regard them in their broader aspect. —K. P. McElroy in *Journal of Ingenuous or Almost Chemistry.*

A Proposed Campaign to Simplify Mathematical Calculations

Everyone knows that the English Monetary System is a freak, without scientific basis. Everyone also remembers the great trouble in his youth with such odd combinations as 12 pence equals one shilling and 4 shillings equal one crown and 20 shillings equal a pound.

There is one system of figures in particular that should be simplified immediately.

It takes half an hour to calculate results if you want to find out anything about circles, spheres or cylinders. All because of a troublesome odd fraction called "Pi." If we all get together and determine to make the value of "Pi" just 3 instead of 3.1416 what a world of time it would save in making these bothersome calculations!

The editor of this paper will accept suggestions as to the method of procedure in this.—A. Nagelvoort in *Journal of Ingenuous or Almost Chemistry.*

THE CHEMIST is not published during June, July, and August. Material which we have been unable to include in the current issue will appear in the October CHEMIST. The September number will be devoted to a roster of the INSTITUTE members, and will contain the constitution of the INSTITUTE.

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